Machine and Tool
BLUE BOOK

"It takes teamwork to control costs on rocket engines"

SAYS ROCKETDYNE'S ROSS CLARK

A Hitchcock Publication

FEBRUARY · 1960

This is a MARVEL High-Speed-Edge Hack Saw Blade Cutting a 4" x 4" Titanium Billet

EVERYTHING'S IMPROVED BUT THE GUARANTEE

33 years ago, MARVEL introduced the first welded-edge hack saw blades . . . guaranteed them to be shatterproof . . . and a new concept of power hack sawing came into existence.

In combining, by welding, two materials—a narrow, high speed steel cutting edge, and a tough alloy steel body, MARVEL pioneered the modern hack saw blade.

When operators learned they could apply the heaviest feed pressures and highest speeds to the new MARVEL Blades with complete confidence that they would never shatter or "explode" to cause them personal injury, hack sawing began the approach to its present high level of efficiency. Even cutting "exotic" metals, such as titanium, where heavier feed pressures are a necessity, the MARVEL Blade does an outstanding job and is completely safe.

Today's MARVEL High-Speed-Edge Hack Saw Blades are greatly improved, even over the MARVEL Blades which were the best on the market a few years ago. Advanced metallurgy has produced better steels; new heat treating and manufacturing techniques have brought further improvements. The only thing unchanged is the Guarantee: THEY ARE SHATTERPROOF!

If you haven't used MARVEL High-Speed-Edge Hack Saw Blades recently, try them on your saws for a month and see the difference a truly superior blade can mean in higher speeds, greater accuracy, lower cost per cut, and guaranteed safety to operating personnel. Your nearby MARVEL Distributor carries a complete stock of MARVEL High-Speed-Edge Blades.

Write for Bulletin CT-175 which has complete details on MARVEL High-Speed-Edge Hack Saw Blades.

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FOR ANY NUMBER OF HOLES, IN ANY MATERIAL, IN ANY PATTERN, ON ALL CENTERS

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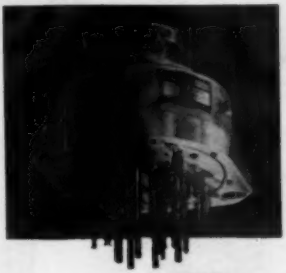

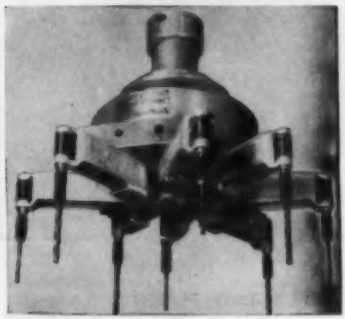

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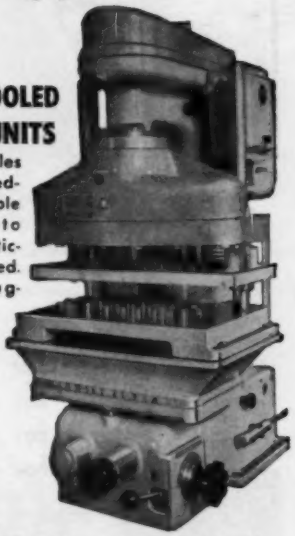

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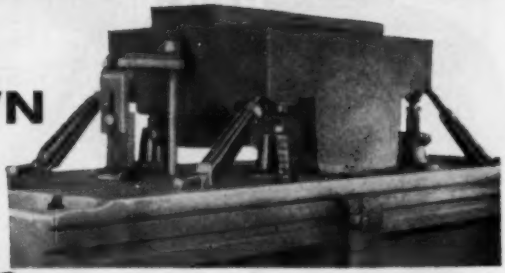

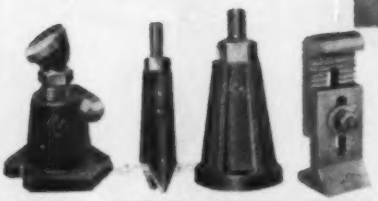

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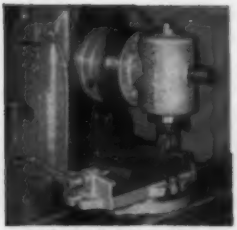
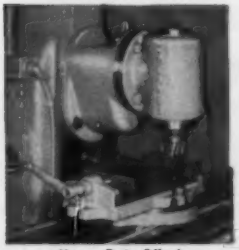


Heavy Duty Vertical Milling Attachment



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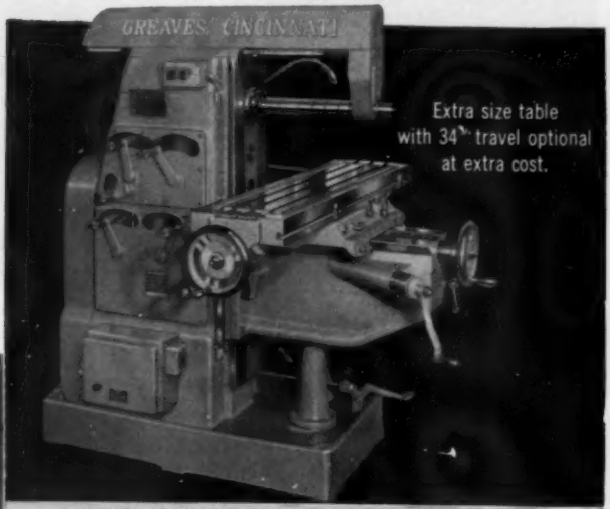

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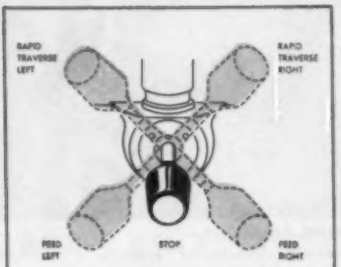
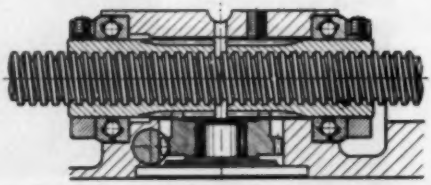


Single Lever Table Control is an operating and set-up advantage originated decades ago by Cincinnati.



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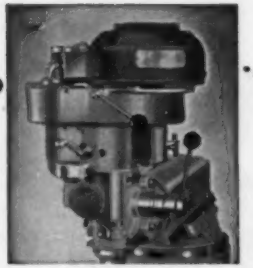

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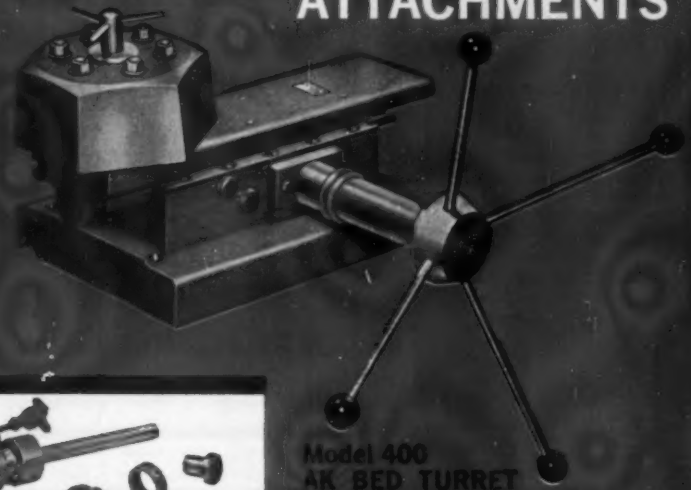

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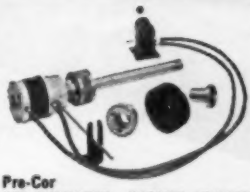

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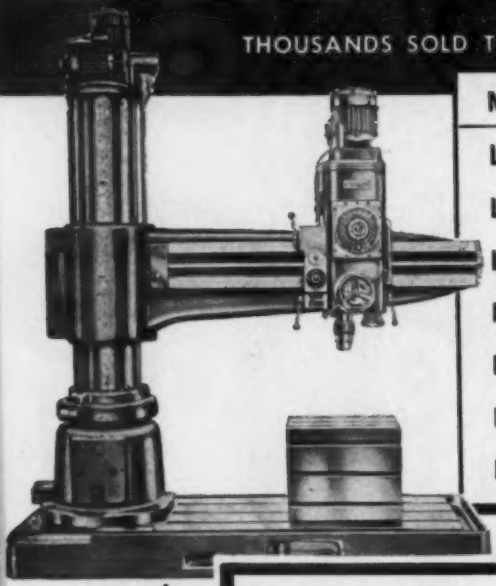

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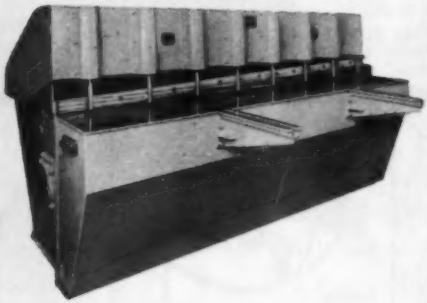

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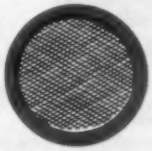

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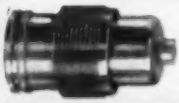
THREADING TIME · 20 SECONDS

FOCUSING NUT · ALUMINUM
1 IN. DIA. · 16 TPI 6 START
THREADING TIME · 25 SECONDS



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a Warner & Swasey 2-A with contouring

Unique Section Template was one idea which Hobart tooling specialists came up with to reduce setup time and minimize template costs. A short template was made up to handle a range of shafts with similar ends. Various length middle sections could then be quickly inserted to obtain various lengths and shoulder locations.

cross slide SLASHES SETUP TIME FROM 2 HOURS TO 20 MINUTES

• *Combines auxiliary operations into one setup*

Hobart Brothers Co.—a leading producer of arc welding equipment and aircraft ground-power units—faced a serious production bottleneck. Long setup time on their older turret lathes and excessive part handling time was crippling the small lot production of motor-generator shafts.

Hobart launched a three-pronged attack to solve the problem by:

1. Installation of a new Warner & Swasey 2-A Saddle Type Turret Lathe equipped with a hydraulically-controlled cross slide contour unit.

2. A creative tooling approach to reduce setup time.

3. A thorough time and motion study to insure efficient utilization of daily production time.

As a result, Hobart Brothers today are producing shafts at 1948 production costs!

Contributing to the success of this efficiency study and modernization program was their new contour cross slide equipped Warner & Swasey 2-A which permitted:

- **Combining of center drilling, facing and threading operations into a single, efficient turret lathe setup reducing part handling time.**
- **Production time savings averaging 35% because of higher horsepower and spindle speeds, and elimination of extra hex turret and square turret handling time. All diameters and grinding reliefs are produced directly from the template.**
- **Holding closer tolerances which reduced grinding time and extended grinding wheel life.**

Check today with your Warner & Swasey Field Representative. He'll gladly tell you how the cost-cutting results of the "Hobart Story" can be a reality on your own operations.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

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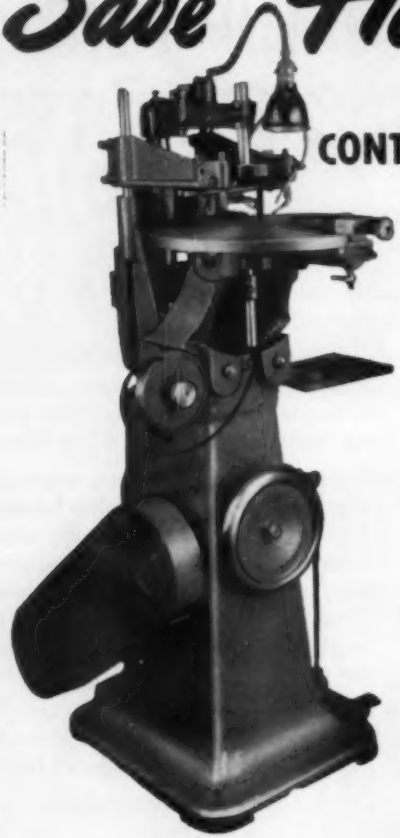
Save Hours in tool rooms and die shops with CONTOUR SAWING AND FILING



You can save real time and money in the production of parts for jigs and fixtures, dies, gages, templates and special machine production by using an Oliver of Adrian contour sawing and filing machine.

The Oliver is so simple to operate that all sawing, filing and lapping can be handled by an ordinary mechanic—saving a skilled die maker's costly time. Parts can be shaped to dimension faster, more accurately with no hand filing or semi-finishing operations. Available in five types – bench or pedestal. Write today.

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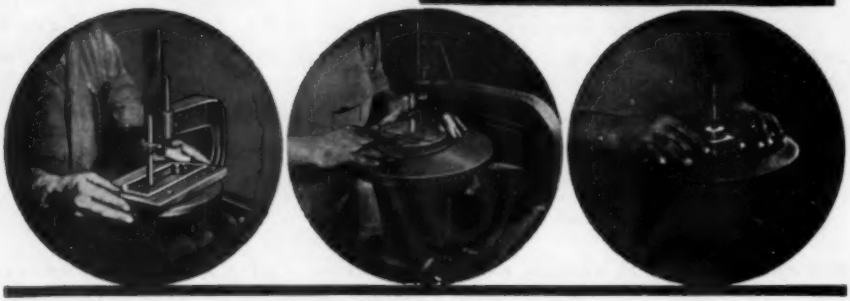

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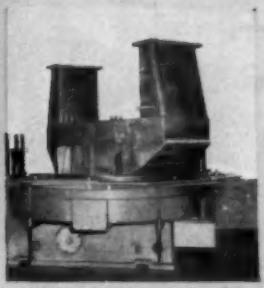
A LAPMASTER CAN MEAN BIG SAVINGS...A BETTER PRODUCT

here are more examples of how:

HIGH PRODUCTION RUNS or small lots—both turned out with *consistent* accuracy on a Lapmaster. Day-in-day-out production rates range from a few pieces to thousands per day.

FLATNESS OF .0000116" or less with a micro-inch finish of 2 to 3 RMS is everyday work for a Lapmaster. Uniform accuracy maintained piece-after-piece because conditioning rings automatically keep lap plate flat.



4920 LB. PARTS can be handled—as well as small ½" dia. pieces. This 84" dia. weldment for a radar tracking antenna was lapped to a flatness and parallelity within ± .00008" on a Lapmaster Model 84.

TALL and SMALL PARTS AT THE SAME TIME. No expensive fixturing required... in most Lapmaster applications only inexpensive masonite or micarta work holders are necessary. Eliminates danger of stresses and warpage usually caused by clamping during grinding.

EXTERNAL and INTERNAL LAPPING IN ONE OPERATION. Versatility of the Lapmaster is demonstrated in this lapping operation on R. R. air brake parts. Reciprocating mechanism runs small lapping block in and out of work while other parts are being lapped on plate.

SHAPE OR FORM NO PROBLEM. Special lap plate and work holder permit lapping of swing check valve. Other simple attachments and holding devices can be furnished to facilitate lapping of "hard-to-handle" or extremely large parts.

Lapmaster

...THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

WRITE FOR THE COMPLETE LAPMASTER STORY

Write for bulletins describing the Lapmaster line and chart on measuring flatness.

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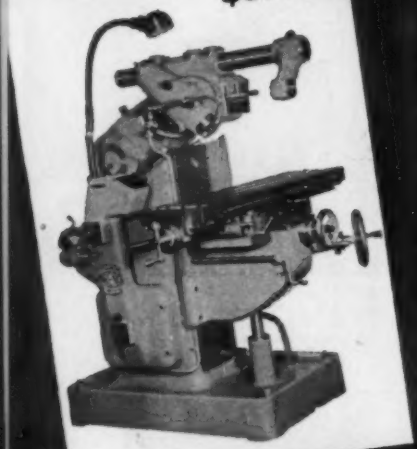
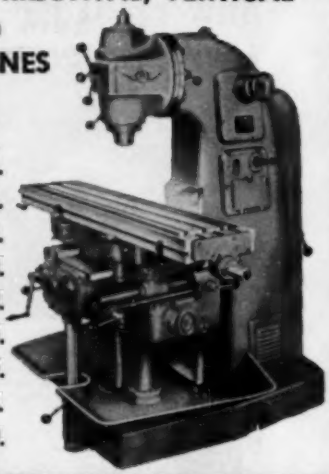


PEDERSEN HORIZONTAL, VERTICAL and combination MILLING MACHINES

Model	Table Size in Inches	Base Price
VPF-00	35½x8¾	$1663.
VPV-00	35½x8¾	$2463.
VPU-0	39½x9½	$2890.
VPU-1	51x12	$3260.
VPV-1	51x12	$3760.
VPF-2	61x12	$6185.
VPU-2	61x2	$6285.
VPV-2	61x12	$6885.
VPF-4	75x16	$12850.



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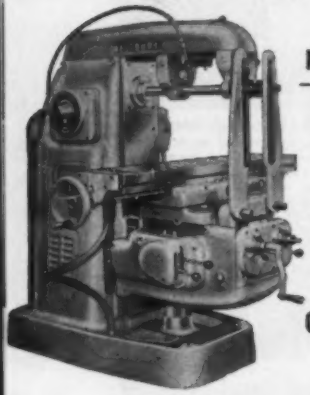


Model	Table Size in Inches	Base Price
1U	40x10	$3390.
2U	51¾x10¾	$5265.
3U	60x12¼	$6275.
1-S	42x9	$1690.
Contour	42x9	$3190.

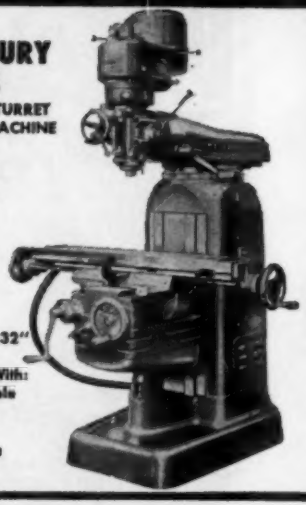
AGENTS WANTED

WESTBURY I-S

VERTICAL TURRET MILLING MACHINE

$1595

Incl. Motor & Controls



1½ H.P. 9"x32" Table

Available With: 9"x42" Table $95. extra

Coolant $155. extra

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SEE OTHER AD ON PAGE 12

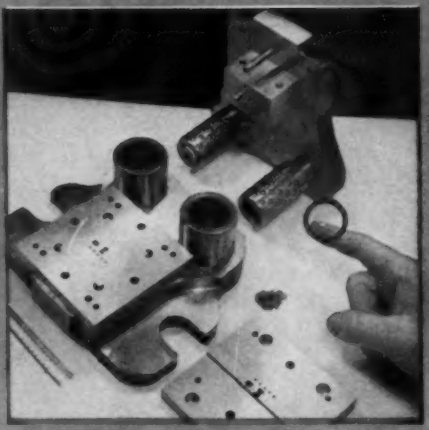
NOBODY SAID "*It Couldn't Be Done*"

BUT ONLY LEMPCO 2 POST STOCK* DIE SETS COULD DO IT!

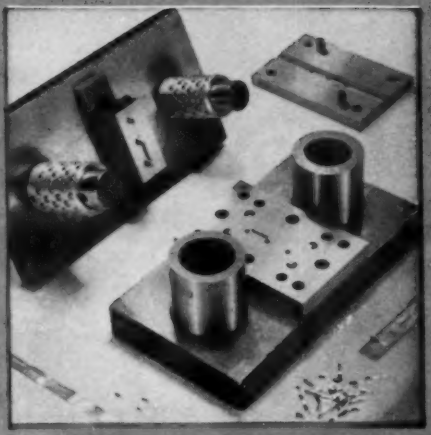
To the best of our knowledge, Lempco is the only 2-post STOCK* die set which could produce this electronics part from .001" thick high nickel alloy material—with punched holes of .001" diameter. This die, mounted in a standard Lempco STOCK* die set, produced 30,000 burr-free parts on its initial run.

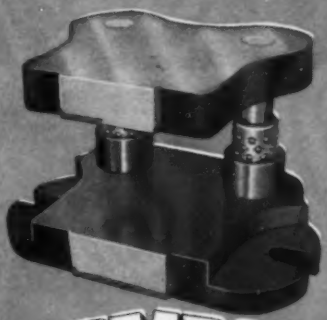
Users everywhere have found that a STOCK* Lempco 2-post die set will out-produce special 4-post "friction type" sets—at a fraction of the cost. You can prove this to yourself!

***Off-the-shelf DELIVERY, with warehouse stocks in all major metalworking areas of the U.S.A.**



MATERIAL: .001" Thick, High Nickel Alloy Punched Holes, .001" Diameter





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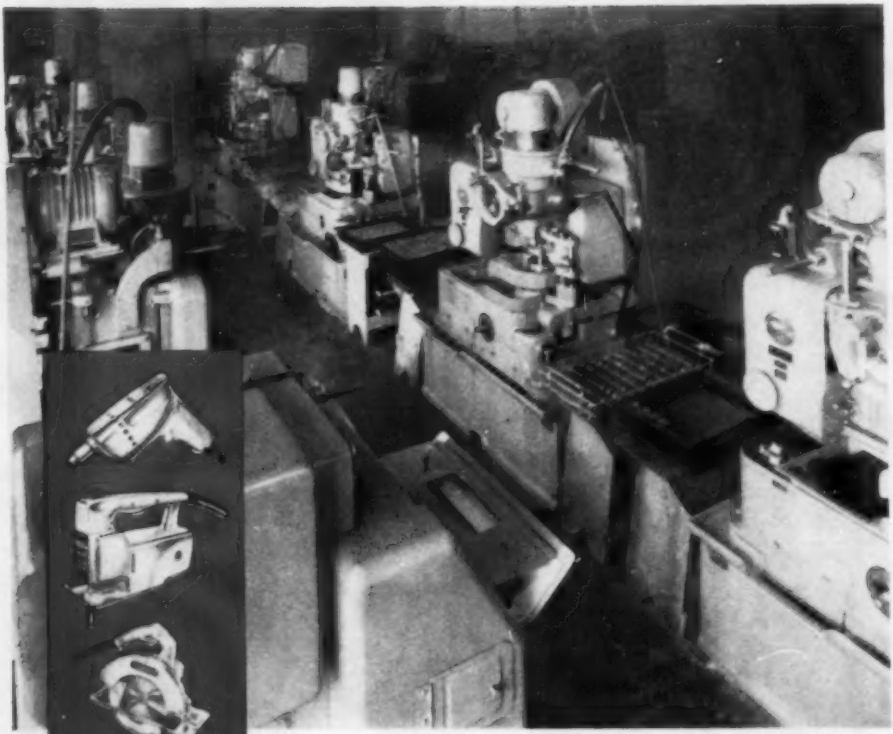


View of production floor at Stanley Electric Tools, showing some of the Fellows Gear Production Equipment used.

Gears produced with Fellows Machines add high quality to these Stanley Electric Tools.

THE PRECISION LINE

Fellows

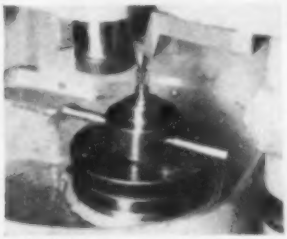
EQUIPMENT at Lower Cost for STANLEY

Stanley is a name you know . . . a name that stands for high quality in electric tools.

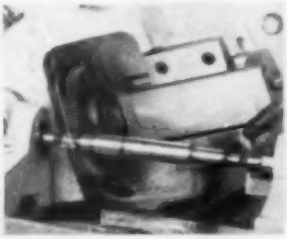
To insure this quality, while providing the high production rates that mean lower costs, Stanley Electric Tools, Division of The Stanley Works at New Britain, Conn., uses Fellows Gear Production Equipment for shaping, shaving and inspecting the armature pinions for its electric tools.

Fellows has long been the leader in Gear Production Equipment, with machines for every gear production job: Fellows Gear Shapers, Pfauter Gear Hobbers, Fellows-Reishauer Gear Grinding Machines, Fellows Gear Shaving Machines and Fellows Inspection Instruments.

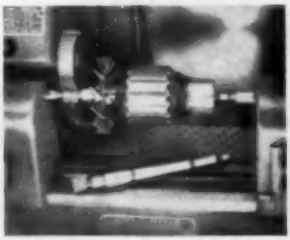
If you make gears of any size, from 1/16″ P.D. to 120″ P.D., Fellows' 60 years of experience can help you improve quality and cut costs. For complete information on Fellows Gear Production Equipment, call your nearest Fellows office.



SHAPING. The versatile No. 7125 Fellows Gear Shaper gives Stanley high production speeds (up to 450 strokes per minute). It also provides fast, simple changeover from one job to another.



SHAVING. The No. 4 Fellows Fine Pitch Shaving Machine puts finishing touches on each pinion and adds the finish which results in long life and quiet operation.



INSPECTING. The No. 4 Fellows Fine Pitch Red Liner makes and records a composite check of gear accuracy, insuring high quality standards.

Gear Production Equipment

THE FELLOWS GEAR SHAPER COMPANY
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Branch Offices:
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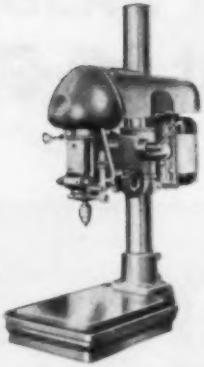

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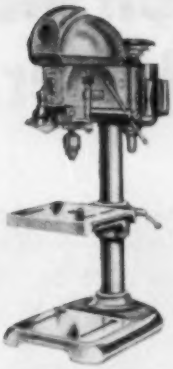
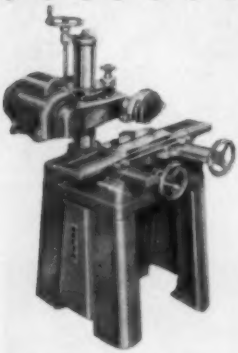


14" DRILL PRESS



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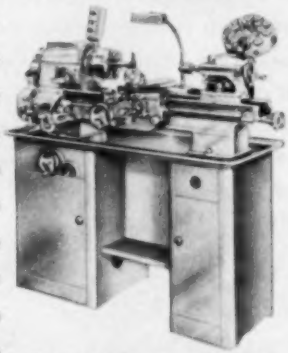

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And because you can combine standard Delta components with automatic control devices, you can have the money-saving advantages of automation at a fraction of the usual cost. Ask your Delta Dealer about Delta "lo-cost automation"—he's listed under "TOOLS" in the Yellow Pages.

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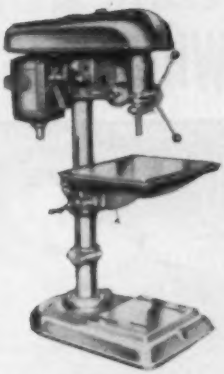

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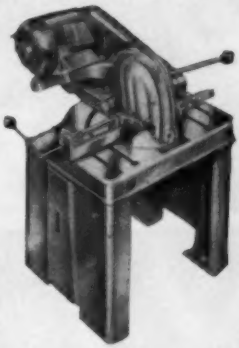

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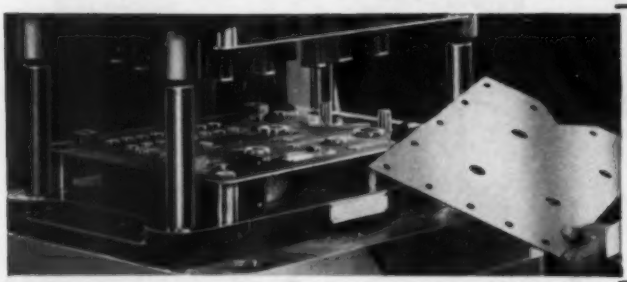

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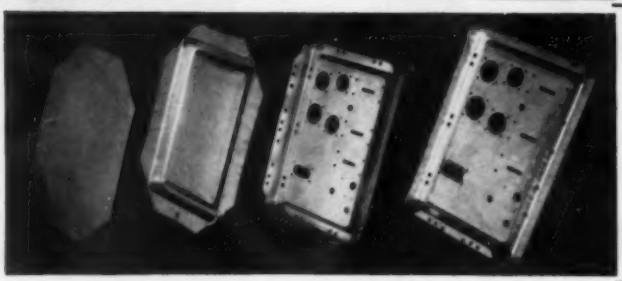

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$595 BURGMASTER Bench Model "O" Turret Drill Replaces $1650 Drilling Machines

Burgmaster Bench Model "O" 6-Spindle Turret Drill ¼" Drill Capacity in Steel — ⅓ H.P.

Brass Galvanometer Body drilled 63% faster on Burgmaster Bench Model "O" Machine. Six holes are held to ±.0005".

63% More Production in 1/3 the Floor Space

A leading manufacturer of electronic equipment uses a Burgmaster Bench Model "O" 6-spindle Turret Drill to perform precision drilling and tapping operations. In the operation shown, six holes requiring five diameters are drilled in a galvanometer body. Holes range from .029" to .113" in brass and are held to .0005" in a jig. The Burgmaster machine, costing $595, replaces five single spindle drills costing $1650 and increases production 63% in 1/3 the floor space.

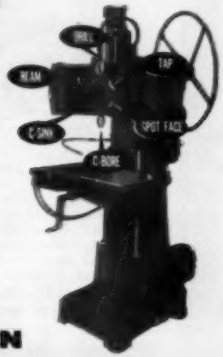
These striking economies are made possible because of unique Burgmaster features. The turret power indexes, at operator command, to perform up to six operations at one location. This speeds production by eliminating drill jig moving required on a line of single spindle drills, and an estimated 650 miles of operator walking per year. Pre-selective, automatically shifted spindle speeds, preset precision depth stops, and a sensitive feed handle assure the most efficient working rate while increasing tool life.

$3450 Burgmaster Turret Drill Replaces $11,000 Machine

Complex Rocket Part is machined at Cadillac Gage Co., West Coast Division on Burgmaster Model 1C costing $3450, replacing $11,000 in single-spindle drilling equipment. Operations now save 75% of the floor space.

Burgmaster Model 1C Six-Spindle Turret Drill — 12 speeds from 325 to 4050 — ½" drill and tap capacity in cast iron — 1 h.p.

Burgmaster Model 1C Six-Spindle Turret Drilling and Tapping Machine



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World's largest manufacturer of turret-type drilling and tapping machines.

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. . . . only with **hydraulic design**

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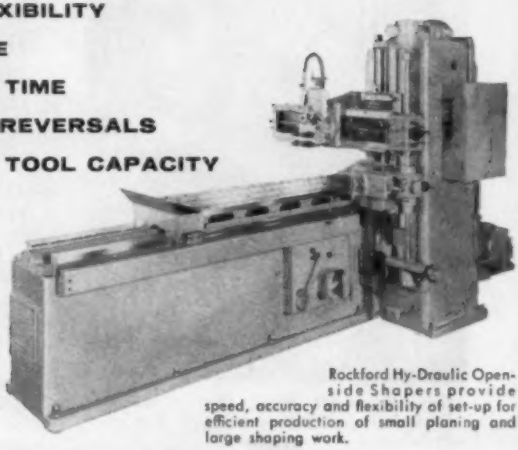
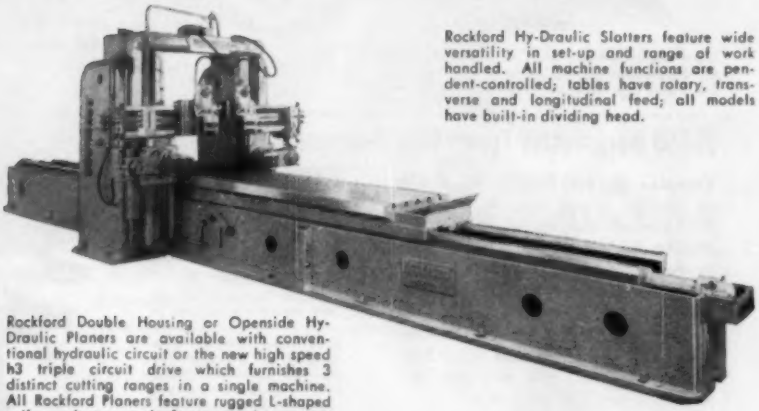


Rockford Hy-Draulic Openside Shapers provide speed, accuracy and flexibility of set-up for efficient production of small planing and large shaping work.

Rockford Hy-Draulic Slotters feature wide versatility in set-up and range of work handled. All machine functions are pendent-controlled; tables have rotary, transverse and longitudinal feed; all models have built-in dividing head.



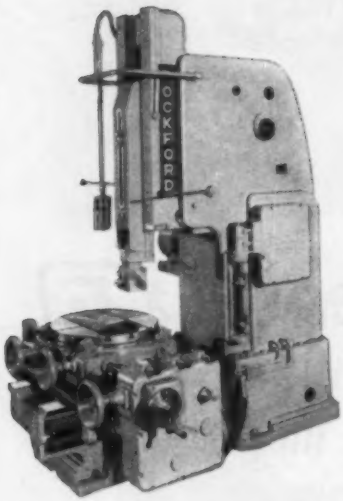
Rockford Double Housing or Openside Hy-Draulic Planers are available with conventional hydraulic circuit or the new high speed h3 triple circuit drive which furnishes 3 distinct cutting ranges in a single machine. All Rockford Planers feature rugged L-shaped rail, pendant-control of set-up and operating functions, and infinitely adjustable hydraulic feeds and speeds.

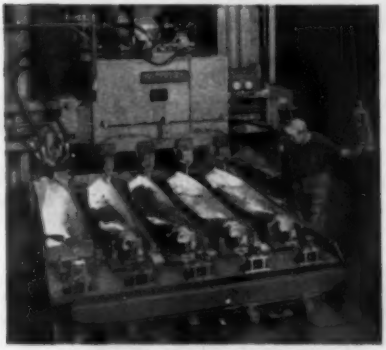
Hydraulic drive and feeds, as basic features of Rockford Hydraulic Machine Tools, provide outstanding performance measured in terms of work quality, high production and low operating cost. They also provide cushioning action essential to use of modern carbide tools.

do you get these advantages!

Today, many metal-cutting operations are performed effortlessly, at low cost, and high production rates on Rockford Hy-Draulic machines. Hydraulic control and power respond instantly so that inexperienced operators easily adapt infinite speeds and feeds to the most complex and accurate machining cuts.

Compare your present shaping, planing or slotting operations with these modern production features, and determine the savings available with Hy-Draulic flexibility. Ask our engineers for estimates on your requirements.





Rockford Hy-Draulic KOPY-KAT transfers single or 2-dimensional forms directly to the work on Rockford Hy-Draulic Shapers, Planers and Slotters. The hydraulic duplicator valve is so sensitive, so exact, that positive duplication of complex forms is completed with the ease of straight production machining.

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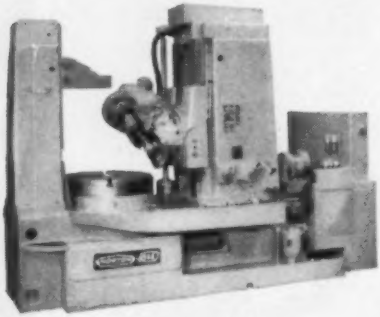
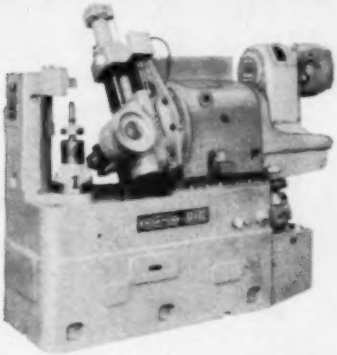
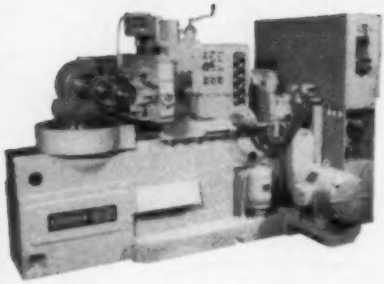
G & E Universal Gear Hobbers are available for commercial and precision production of spur and helical gears, up to 160" diameter.



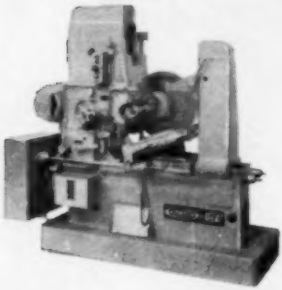
G & E 10HQ HOBLIQUE Universal Gear Hobber is designed for high speed, high production hobbing of spur and helical gears up to 10" diameter.



Norton Welcomes G&E



G & E Worm Gear Hobbers are long established leaders for fly tooling or hobbing commercial and precision worm gears up to 100" in diameter.



G & E Gear and Rack Cutting Equipment for automatically cutting a diversified range of spur and bevel gears, sprockets and racks.

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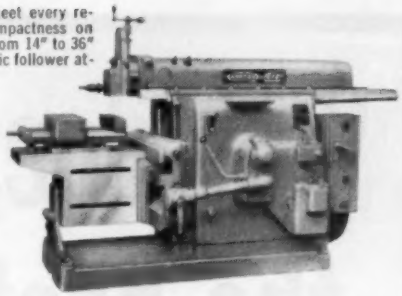
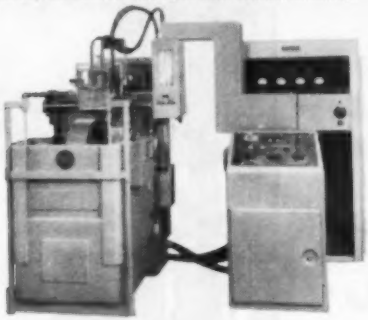
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

G & E Tool Room and Industrial Shapers meet every requirement for speed, accuracy and compactness on general work. Available in seven sizes from 14" to 36" stroke. Can be equipped with an hydraulic follower attachment.



G & E Delapena COLD-HEAT Gear-Tooth Induction Hardener employs a revolutionary new process for hardening gear tooth profiles. A patented intensifier operating under water, consistently produces a uniform hardness pattern, and reduces distortion to an absolute minimum.



. . famous shapers and gear cutting machines join fast growing machine tool family

The addition of the Gould and Eberhardt Division expands capacity and adds a variety of products to the Norton line to serve you better in the Machine Tool field.

The G & E machines shown here are popular leaders in the broad line that will continue in its entirety. Transferal of the manufacture of these machines to Norton headquarters is accompanied by the technical know-how that has made G & E a long established, highly valued supply source of metal cutting equipment.

At Worcester, production of G & E machines is assured the top quality standards that have made Norton the world's largest supplier of grinding machines and lappers.

Norton will be glad to help you select the G & E equipment you need for the results you want. For further information or for G & E parts, write NORTON COMPANY, Gould & Eberhardt Division, Worcester 6, Massachusetts.

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MACHINE TOOLS
Making better products
. . . to make your products better

MACHINE TOOL DIVISION: Grinding and Lapping Machines —
G & E DIVISION: Shapers • Gear Cutting Machines • Gear Induction Hardeners

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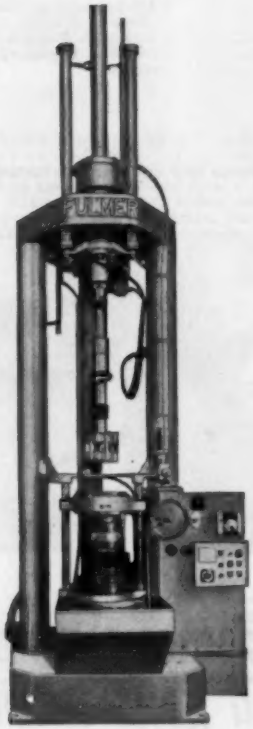

Honing machines, unlike most machine tools, do not require massive weight and rigidity to maintain accuracy. Fulmer designers recognize this basic concept by "beefing up" their machines only where it counts . . . with heavy-duty oversize spindles, bearings and gear train . . . the vital working parts. Functionally designed Fulmer Honing Machines save you money by eliminating needless masses of high-priced cast iron and steel . . . they *weigh less, cost less.*

Fulmer machines combine simplicity with flexibility, quality with economy. All this and never a charge for service!

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Honing Machines

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CUT DOWN TIME IN HALF

BENCO

DIAL ADJUSTABLE TENSION

MASTER PUSHERS

WITH

CARBIDE PUSHER PADS

Scrap due to short pieces and scored stock reduced up to 500% is reported by users of Dial Adjustable Tension Master Pushers equipped with Solid Carbide Pusher Pads. Another common experience is a 50% reduction in down-time to adjust feeding tension and replace worn pads.

It's so simple to obtain the exact tension desired by turning the sleeve and reading the dial. The larger numbers indicate higher tension and the smaller numbers indicate lower tension. Thus the tension can be adjusted precisely right for each combination of material, stock weight, stock finish and feed-out length.

Reduce scrap and down-time, increase production with Benco Dial Adjustable Tension Master Pushers and Carbide Pads. They're the most profitable tools your machine can use.

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dial the right tension for your job.

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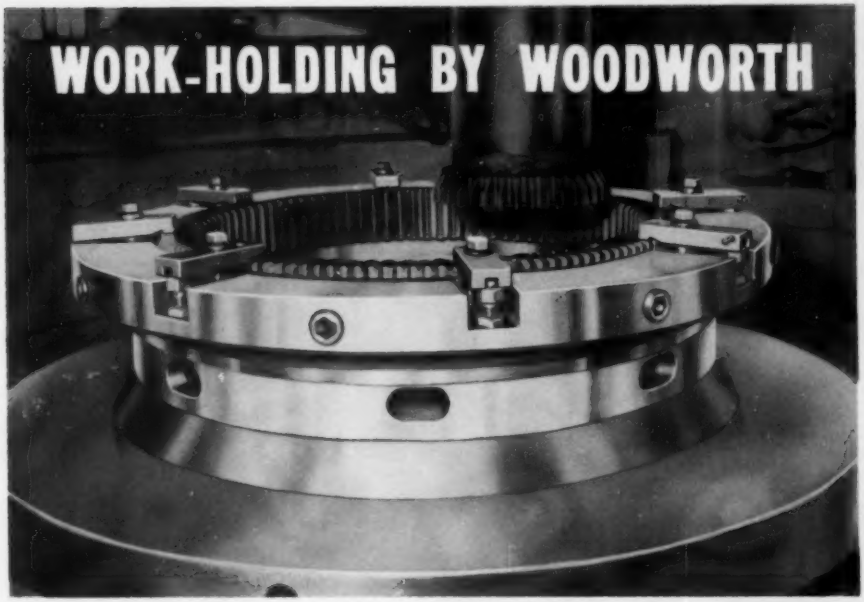

CATERPILLAR GEARS SHAPED WITH MAXIMUM ACCURACY USING WOODWORTH SPECIAL CENTRALIZING FIXTURES

- Designed specifically for Caterpillar Tractor Co., Peoria, Ill., special Woodworth centralizing fixtures are installed on twelve Fellows Gear Shapers for internal shaping of Caterpillar's transmission gears.
- The fixture illustrated above is used for machining two different gears. Change-over from one gear (17.250 P.D.) to a second gear (17.580 P.D.) is accomplished quickly. Rough and finish shaping of internal teeth is performed at 108 strokes per minute, .0132 feed per stroke.
- External gear teeth have a 6 diametral pitch and 20° pressure angle. The whole depth of cut in the spur gear is .3765.
- By interchanging locating pins and stops, Woodworth's fixtures are quickly and easily adapted to accommodate similar parts for which they were designed.

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METALS WAREHOUSE CHOOSES STEELWELD SHEAR

Shearing A7 carbon plate ½" x 96" x 30'. This is a mechanically operated 12E-12 Steelweld Pivoted-Blade Shear.

Proves Highly Advantageous in New Berkeley Warehouse of Ducommun Metals & Supply Co.

VERSATILITY, speed, accuracy and ease of operation were dominant factors that led Ducommun Metals & Supply Co. to select a Steelweld Shear for its new metals warehouse in Berkeley, California.

Write for free MECHANICAL SHEAR CATALOG No. 2011 or HYDRAULIC SHEAR CATALOG No. 2030

STEELWELD

PIVOTED BLADE

Mechanical and Hydraulic **SHEARS**

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

Ducommun's report on the shear follows:

1. **Used for:** A7 plate 3/16" to ¾" x 12 ft.
   Aluminum plate 3/16" to ¾" x 12 ft.
   Stainless plate 1/8" to ½" x 12 ft.
   Brass & Copper 3/16" to ¾" x 9 ft.
2. An important advantage is ease of shearing a wide variety of types and sizes of metals each day from thin narrow strips to heavy, wide plates. The knife clearance adjustment, plus the fast and accurate power back gage, makes changes from one thickness and size to another very fast, yet permits us to produce high quality shearing.
3. Another reason for selecting the Steelweld Shear was the low rake angle of the blade. This permits flatter shearing.
4. The power back gage offers a plus factor in that we can use it in conjunction with our front feed rolls to back off plate for accurate alignment when shearing to a front gage.
5. When the Steelweld Shear was being installed, our sheet shear was being re-located in the warehouse, and we could not shear an order for 26 gage stainless. With the Steelweld knife clearance adjustment, we were able to shear the material very accurately with a minimum of burr.
6. Operator is very pleased with ease of operation and the many adjustments available.

STEELWELD MACHINERY DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 5261 E. 282 ST. • WICKLIFFE, OHIO

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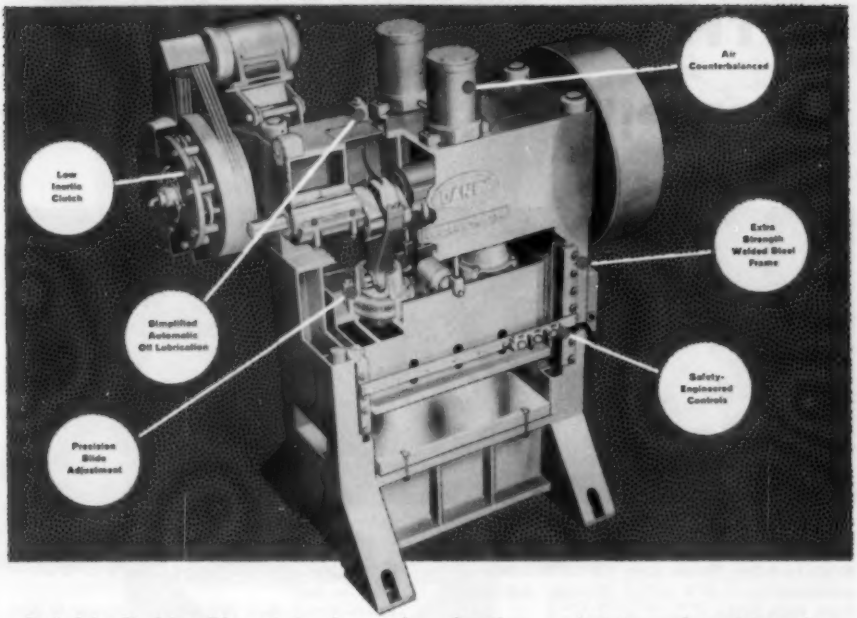
YOU GET STANDARD-DESIGN ECONOMY, CUSTOM-BUILT FEATURES WITH

DANLY SC STRAIGHT SIDE CRANKSHAFT PRESSES



Backed by Danly's solid reputation for sound design and quality construction, Danly Series SC Presses offer pre-engineered, standardized design, to assure economy for general stamping work. At the same time, they offer outstanding features normally found only on custom-built presses.

Like all Danly Presses, the SC's have husky, rigid frames, to deliver accurate die closure with minimum deflection . . . which means longer die life. Automatically lubricated, quiet, smooth-running drive guarantees longer press life. Every detail of the Danly SC line has been engineered to shrink downtime . . . to put more hours into production time.

Series SC Presses are available in capacities from 50 to 300 tons. Roll feeds and variable speed drives are available for completely automatic, high-production operation.

WRITE FOR NEW CATALOG. Gives full details on Danly low-maintenance, air-friction clutch, and other features. Lists full specifications. Ask for Bulletin SC.

DANLY

DANLY

DANLY MACHINE SPECIALTIES, INC., 2100 S. LARAMIE AVE., CHICAGO 50, ILLINOIS

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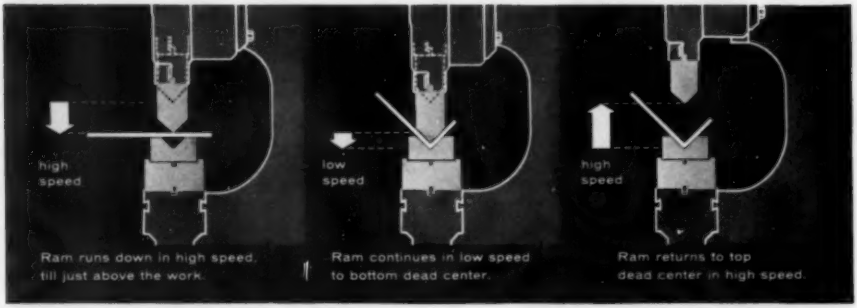
INCREASE PRODUCTION AS MUCH AS 60% WITH CINCINNATI®

Automatic Cycle Press Brakes


high speed
low speed
high speed
Ram runs down in high speed, till just above the work.
Ram continues in low speed to bottom dead center.
Ram returns to top dead center in high speed.

If you form long, flexible parts, you can increase your production up to 60% with a Cincinnati Automatic Cycle Press Brake.

A new, exclusive feature, the Cincinnati Automatic Cycle provides a combination of instantaneous fast and slow ram speeds with every stroke. As a result, you get maximum production speed without the "whip up" and "back bending" which often occur in high speed forming of long parts which have no beam strength.

You no longer have to rely on the operator's skill at clutch slipping to obtain parts that are free of "back bends."

You can get this money-making feature on all new 7 and 9 Series Cincinnati Press Brakes.

This productive new feature means a lot of advantages for you:

1. Job records show 10% to 60% increase in parts formed per hour.
2. Low speed portion of the ram stroke can be set so that all strokes are identical in length.
3. Rejects caused by "back bends" are stopped.
4. Highly experienced operators are not required.
5. Operator fatigue is greatly reduced because there is no need for clutch slipping.
6. Clutch and brake are long-life, minimum-maintenance units requiring no adjustments.

Write Dept. H for full details about the Cincinnati Automatic Cycle, Bulletin B-9R.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO. Cincinnati 11, Ohio, U.S.A.

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This time . . .

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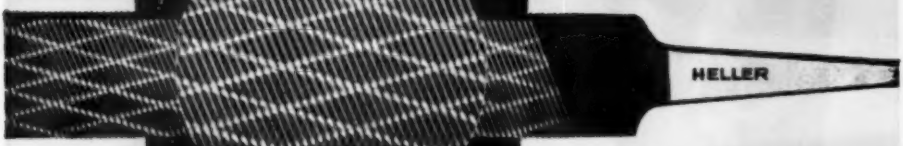
THIS NEW HELLER ORIGINAL DESIGN meets industry's demand for a multi-purpose file that roughs to size and smooths to finish faster . . . with less pressure on tough, dense metals . . . with less loading on softer metals.

DOUBLE DIAGONAL CHIP-BREAKER GROOVES are the exclusive key to the new CRISS-CROSS Multi-Kut files superior performance.



HERE'S HOW THEY WORK! Each section of the CRISS-CROSS pattern has "flying wedge" action for faster penetration. Then, widening teeth hog off metal in time-saving bites. Finally, narrowing teeth finish the work to specified smoothness. In the meanwhile, the combination of vari-sized teeth and criss-cross grooves breaks up chips and keeps them on the move.

SEE THE CRISS-CROSS MULTI-KUT IN ACTION! Your nearby Heller distributor will be glad to demonstrate this Heller "Job-Proved" file on the metals of your choice. Available in Flat, Half Round and Square shapes in 8", 10", 12" and 14" sizes. Why not make a date today?

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permits
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	9 x ⅛ x ⅞"	4.67	4.24	3.73	3.49

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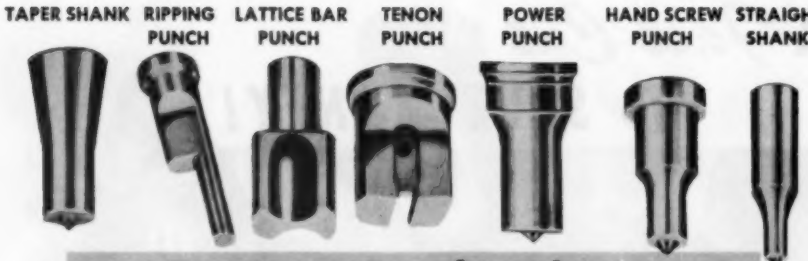

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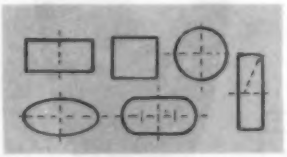

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Here's WHY You Save Money Using CLEVELAND Punches

Cut Tool Set-Up Time! Only with CLEVELAND punches and dies can you punch ANY size hole from ⅛" to 1⅛" with the SAME coupling nut and punch stem! No buttons, no filler blocks, no make-shifts necessary!

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A-204-A

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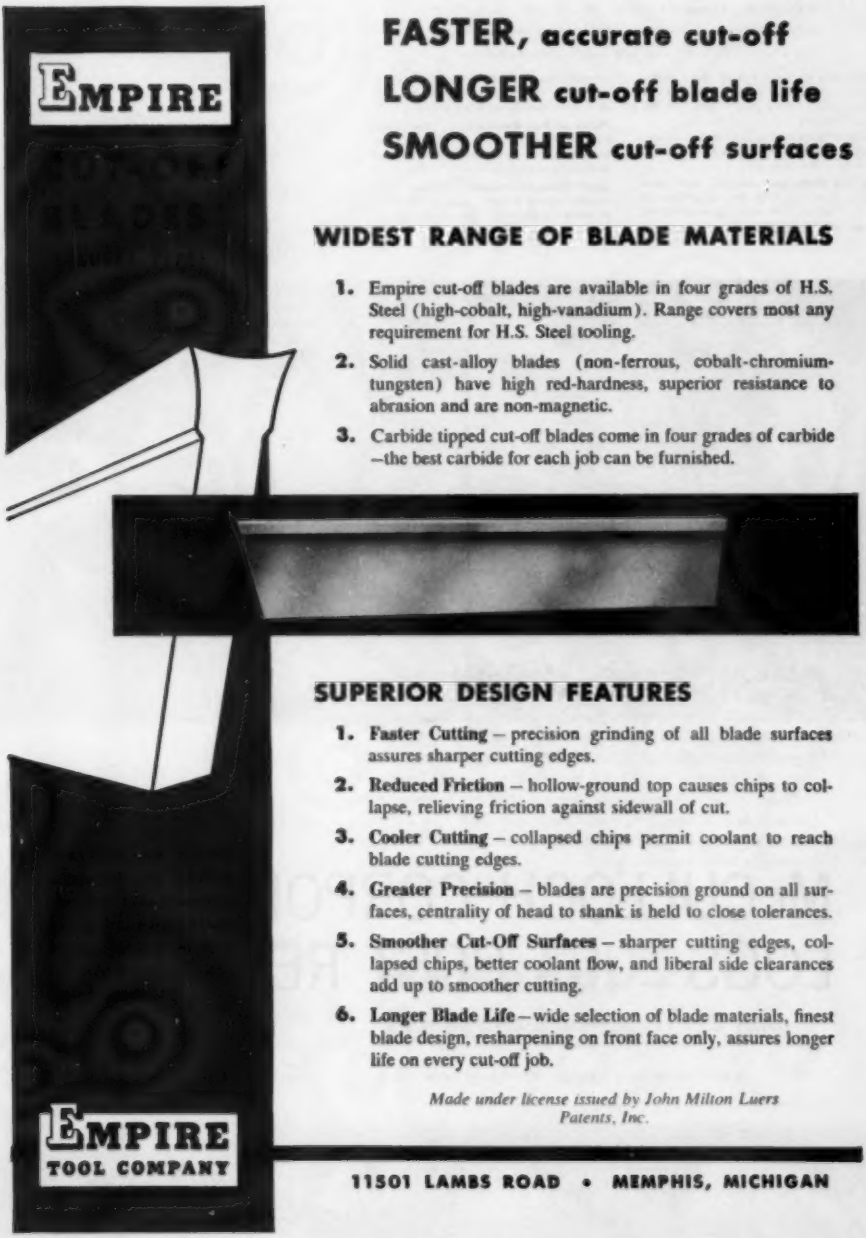

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SMOOTHER cut-off surfaces

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1. Empire cut-off blades are available in four grades of H.S. Steel (high-cobalt, high-vanadium). Range covers most any requirement for H.S. Steel tooling.
2. Solid cast-alloy blades (non-ferrous, cobalt-chromium-tungsten) have high red-hardness, superior resistance to abrasion and are non-magnetic.
3. Carbide tipped cut-off blades come in four grades of carbide —the best carbide for each job can be furnished.

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1. **Faster Cutting** – precision grinding of all blade surfaces assures sharper cutting edges.
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5. **Smoother Cut-Off Surfaces** – sharper cutting edges, collapsed chips, better coolant flow, and liberal side clearances add up to smoother cutting.
6. **Longer Blade Life** – wide selection of blade materials, finest blade design, resharpening on front face only, assures longer life on every cut-off job.

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EMPIRE TOOL COMPANY

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Direct Costs: these include direct-dollar savings as realized by the McCulloch Corporation . . . an "every day" job for Acme-Gridleys.

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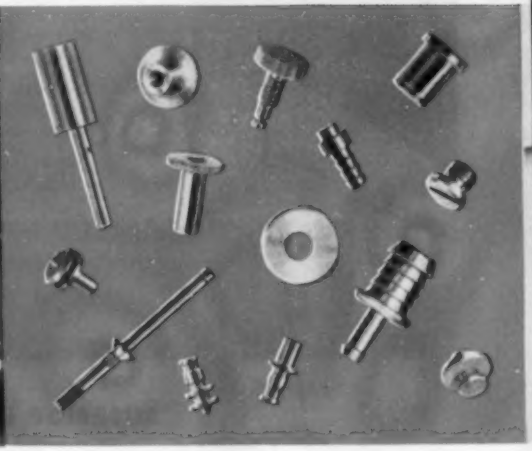
Spot Modernization: pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.



McCULLOCH CORPORATION LOGS 200% COST REDUCTION

. . . with Acme-Gridleys

Reduced cost-per-piece of tilt-lock knobs was but one of the enviable savings made possible for the Marine Products Division of the McCulloch Corporation by an Acme-Gridley RA-6 Spindle Automatic. In addition, McCulloch boosted output 200%, practically eliminated scrap losses, and greatly improved finish and final appearance of this small but critical part.

Previous production methods required one primary and two secondary operations. Now, complete machining—including deburring, is done in one automatic operation on the Acme-Gridley.

Dramatic savings in the production of parts like this make Acme-Gridleys a vital, cost-saving cog in McCulloch's highly efficient production set-up. Evidence of this leading manufacturer's high regard for Acme-Gridley efficiency is the fact that 14 different parts for their popular 60HP "Flying Scott" are produced on the rugged, versatile RA-6 Automatic.

It will pay you to thoroughly study the savings possible with Acme-Gridleys. Call, write or wire for complete details on industry's most modern approach to tangible cost reduction.

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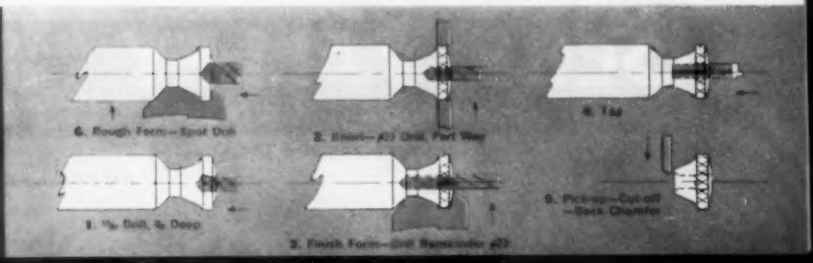

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NEW COOL BLUE "CAMPBELLENE"

—*the Concentrate with* ODOR MASK

COOL BLUE CAMPBELLENE is a brand-new coolant concentrate, the first ever offered with ODORMASK to drastically reduce offensive odors. Fully tested in both laboratory and field, COOL BLUE CAMPBELLENE is perfect for all abrasive cutting and most grinding operations. Only COOL BLUE CAMPBELLENE has all these big features:

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ORDER DIRECT FROM FACTORY. Shipping direct from factory keeps costs down. 1-gallon can only $3.90, 5-gallon pail a low $17.50. We'll ship your CAMPBELLENE in 24 hours. Terms net 30 days, F.O.B. our factory in Bridgeport, Conn. Also quarter drums and 55-gallon drums for greater economy. Complete details and prices on request. *ORDER TODAY!*

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No. 6	⅝" cap. Flanger for flat and dished heads 24" to 20'.
No. 7	¾" cap. Flanger for flat and dished heads 28" to 20'. Up to 8" knuckle radius.
No. 56	Model 3/16" cap. Elliptical Head Shear and Flanger.

Above machine a No. 60 Model ¾" cap. Circle Shear. Throat of 23"; Size range from 15" to 12'3"; Two speed operation—12.5 and 25 ft. per minute.

No. 40 Model ¼" cap. Circle Shear; Throat of 15¼"; Size range from 15" to 12'3".

BLUE VALLEY MACHINE & MFG. CO.

6832 Truman Road KANSAS CITY 26, MO.

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Specify Ex-Cell-O standard power units and cut your machine tool lead time

Today's demand for increased productivity, lower per-unit cost, even on relatively short runs, is being met economically by automatic, single-purpose, high-production machines —consisting essentially of a plain base and one or more Ex-Cell-O Quill-Type Hydraulic Power Units.

These standard, self-contained Ex-Cell-O Hydraulic Power Units are now being used for: drilling, counterboring, spot facing, reaming, as well as prime movers for milling equipment. Multiple operations may also be performed.

For the full story on the cost-saving advantages get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

*** Style 22—8-inch Stroke; Style 22-L—12-inch Stroke.**

58-21R

EX-CELL-O PRECISION PRODUCTS INCLUDE: MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN — *Machinery Division*

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SYNTRON cost-reducing equipment of proven dependability

SYNTRON Vertical Vibratory

PARTS FEEDERS

. . . replace manual methods of handling small parts . . . handle parts of almost every size, shape and material at high instantly controlled rates to tapping, counting, inspecting, tooling, centerless grinding, stamping machines, and other operations.

SYNTRON Parts Feeders offer dependable, high count, single file feeding of parts. Designed for efficient, dependable service with little or no maintenance.

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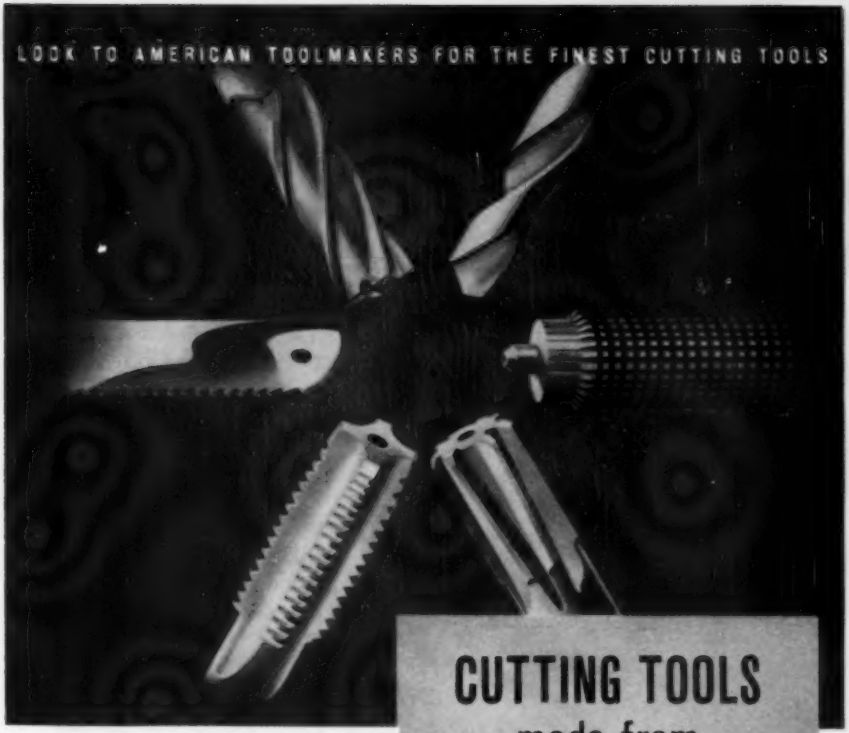

CUTTING TOOLS made from HIGH SPEED STEELS *are Better Than Ever*

Today's high speed steel tools for tapping, drilling, milling, broaching, reaming, sawing and other metal cutting operations are better than ever. Through research and development, and new and better production methods, American toolmakers are constantly improving high speed steel tools to help you make better products . . . at less cost.

As a leading producer of high speed and other specialty steels, Universal-Cyclops continues to aid your toolmaker's efforts with its own aggressive research and development program.

Look to your American toolmaker for the finest in high speed steel cutting tools!

UNIVERSAL CYCLOPS
STEEL CORPORATION
BRIDGEVILLE, PA.

TOOL STEELS • STAINLESS STEELS • HIGH TEMPERATURE METALS

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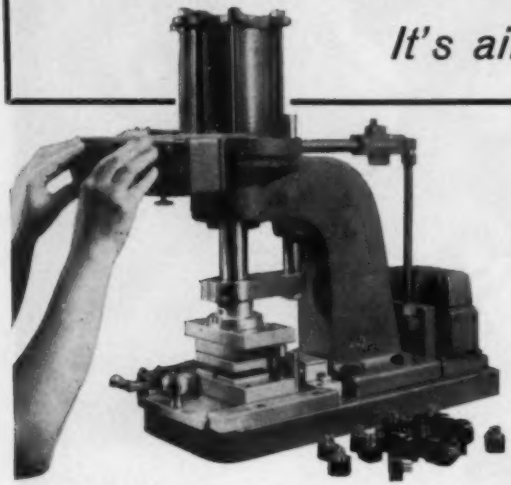
Solve your "Small Parts" production problems with a HANNIFIN "HAN-D-PRESS"

It's air operated!



The husky Hannifin "Han-D-Press" takes operator fatigue out of light production operations where speed is the key to economy. A safe, easy-to-operate Hannifin air-operated bench press can handle these sometimes troublesome jobs better, faster and easier.

RIVETING
STAKING
PUNCHING
PRESSING
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CHECK THESE FEATURES:

- Electric control through Hannifin 4-way solenoid-actuated valve.
- Guided ram. Speed easily adjustable. Automatic return.
- Removable steel base plate. Easy to change job set-ups using alternate work bases.
- Minimum maintenance. Rigid frame; cylinder "tru-bored" and honed.
- Half-ton and one-ton models. Low prices. Immediate delivery.

Call Your Hannifin Man for Complete Information

HANNIFIN COMPANY
529 South Wolf Road • Des Plaines, Illinois

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You don't have to see the "Red End" to know it's a

SIMONDS

HACKSAW BLADE

Just put it to work

. . . that's all!

Performance speaks for itself. And if you think there's no difference in hacksaw blades, try this:

TEST 1 BOX OF 10 SIMONDS "RED END" BLADES AGAINST ANY 10 OTHERS

Then you'll know you're getting more for your hacksaw dollar than you ever got before. And then you'll see why so many other hacksaw users "Say Simonds and Save!"

Simonds "Red End" Power Blades come in All-Hard and Shatterproof types in all standard lengths, thicknesses and tooth spacings . . . a "right" blade for every job! Three types of Hand Blades are also furnished in all standard specifications for best results at lowest cost.

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For Fast Service from Complete Stocks
Call your
SIMONDS Industrial Supply DISTRIBUTOR

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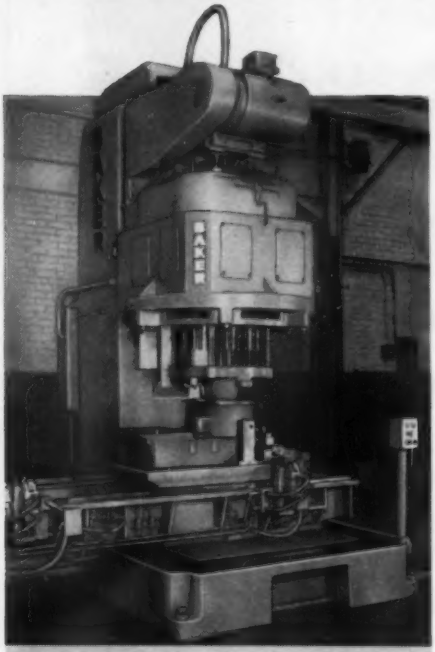
A special machine job done by a STANDARD BAKER®

ADJUSTABLE SPINDLE MACHINE



Baker A-24-VU Adjustable Spindle Machine with standard 36" round universal head and standard slip plate bored for 46 spindles.

An automotive contractor wanted to avoid special machine costs in handling heavy, awkward truck transmission housings. He also desired retooling economy.

THE RESULT: This BAKER A-24-VU Standard Adjustable Spindle Machine, fitted with slip plate, bushing plate and transfer, including a pallet to hold and transfer the work piece from prior operations.

The BAKER drills 2 sets of bolt circle holes on the top flange and 1 set at the housing bottom. A bushing plate, supported on the slip spindle plate, guides drills and targets into pallet bushings for positive location.

This BAKER Standard gives the necessary high production and is easily removed from the transfer line for other drilling and tapping operations.

For the complete story on how BAKER Standard Adjustable Spindle Machines can solve your special production problems, write Baker Brothers, Inc., 1000 Post Street, Dept. TH-260, Toledo 10, Ohio.

THIS IS REAL *Flexibility*

NOW... COMPLETELY INTERCHANGEABLE

TO FIT 2 SIZES VERTICAL MACHINES		TO FIT 2 SIZES HORIZONTAL MACHINES
	21 ADJUSTABLE SPINDLE HEADS 27 FIXED SPINDLE HEADS 3 TYPES STANDARD TABLES	

BAKER®

STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES • AUTOMATIC BAR MACHINES

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GET TRUE READINGS ON FINISHES EVERYTIME, EVERYWHERE WITH

SURFINDICATOR

Job to job, plant to plant, *every* Brush Surfindicator gives true and identical readings from 0 to 1000 microinches on the same surface. Precision reference standard comes with every unit; makes field calibration simple and eliminates need for factory adjustment. The Surfindicator is immune to magnetic fields, vibration, line voltage variations; weighs but 15 pounds and is completely self-contained. **ONLY Brush Surfindicator Complies Completely With ASA and MIL Specs. See For Yourself. Request A Demonstration.**

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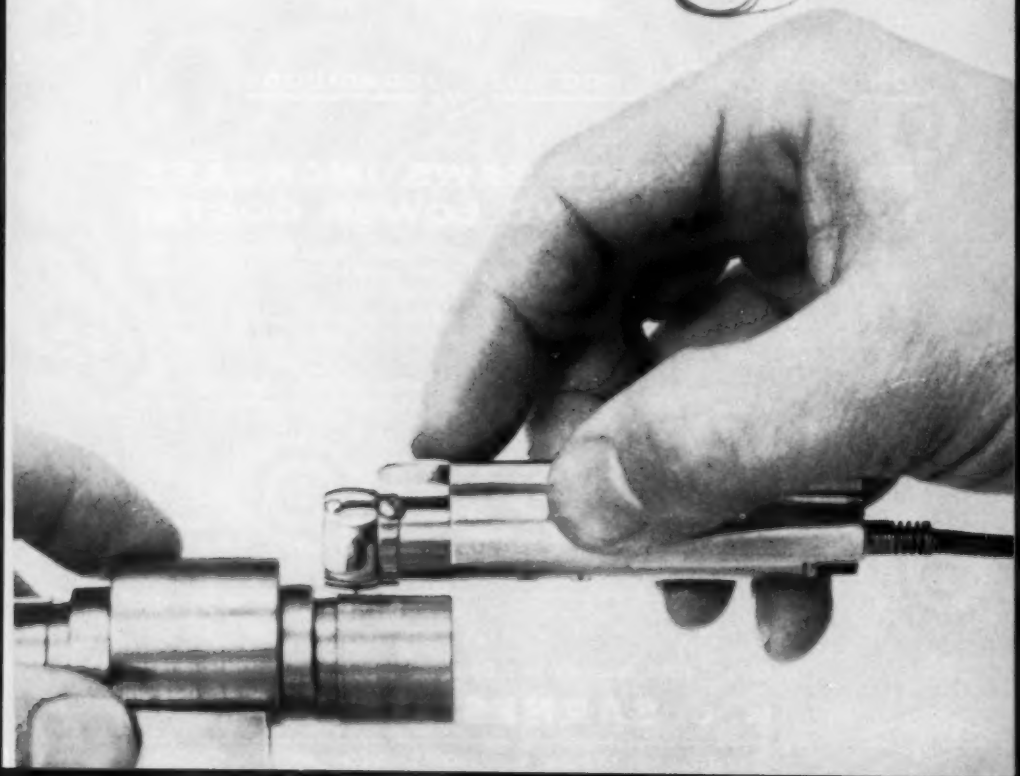
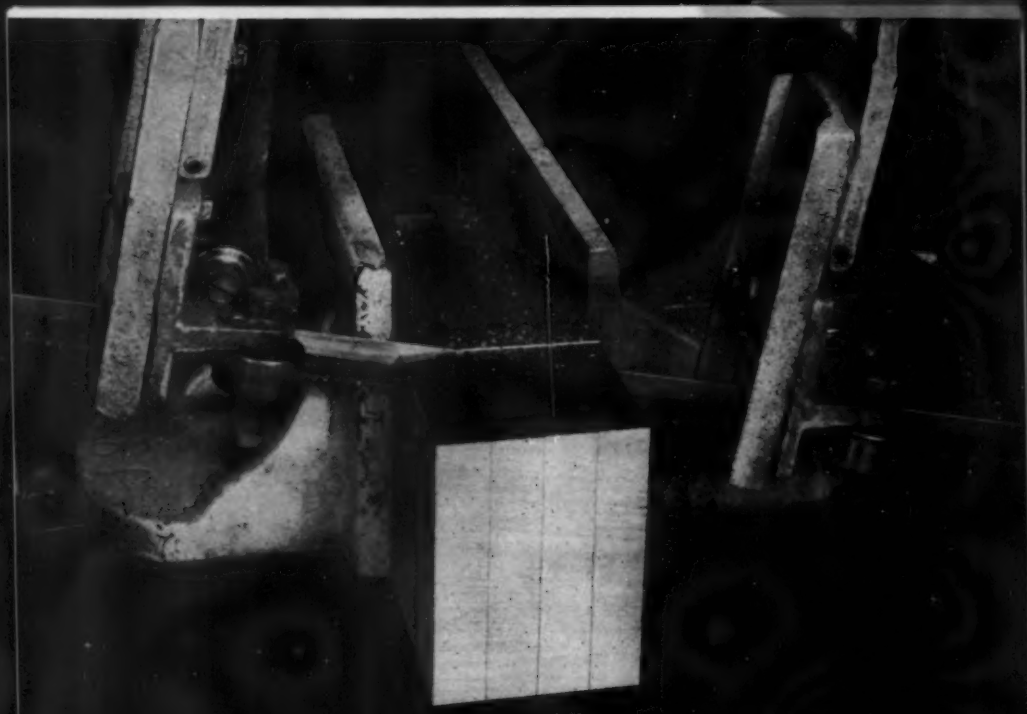




On contouring and cut-off operations . . .

BARNES BAND SAWS INCREASE PRODUCTION AND LOWER COSTS!

From high production cut-off to intricate contour sawing operations, Barnes Hard Edge Flexible Back Band Saws are made to last longer, cut faster and more accurately. The result is a lower cost-per-cut and an ultimate over-all reduction in metal cutting costs.

You can expect superior performance from all Barnes Band Saw Blades because they are manufactured to the highest standards of quality. Teeth are accurately milled and set, perfectly hardened; backs are flexible.

Barnes Band Saws are packaged for your convenience and safety in 100-foot coils and in 250 or 450-foot random lengths. Band saws perfectly welded to a desired length are also available, packaged individually or 10 to a carton.

ARC-LINE WAVY SET

Best for sawing thin sections and for general-purpose cutting of varied shapes and sizes. Designed to absorb shock, minimize tooth stripping.

ARC-LINE RAKER SET

Preferred for accurate contour sawing and for straight cut-off of large solids, thick plate. Gives maximum wear-resistance.

BARNES SKIP TOOTH

Ideal for fast cutting of non-ferrous metals, plastics and wood. Provides rapid chip removal on heavy sections.

BARNES HOOK TOOTH

Recommended for fast cutting of mild steels, especially medium and large cross-sections. Also widely used on plastics and woods.

Call your Barnes Distributor

W. O. BARNES CO., INC.

1297 TERMINAL AVENUE • DETROIT 14, MICHIGAN

Rodgers Presses

PRECISION HYDRAULIC POWER

FOR METAL FORMING and DRAWING

From Rodgers "Standard" Line Select your "Custom" Model

Easy as A B C:

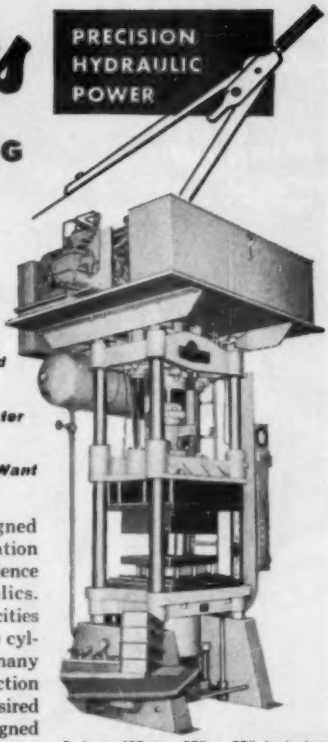
A — *Determine Press Tonnage and Style Press You Need*

B — *Bed and Frame Size Required... Solid or Open Bolster*

C — *Select Pump Unit and Controls To Give Speed You Want*

The New Standard line of Rodgers Platen Presses has been designed to greatly simplify press selection. From the basic press styles, one may be selected and combined with varied pumps and controls, automatic, semi-automatic or pressure sensitive, to give the desired speed and performance. This results in savings of "custom" engineering and costs.

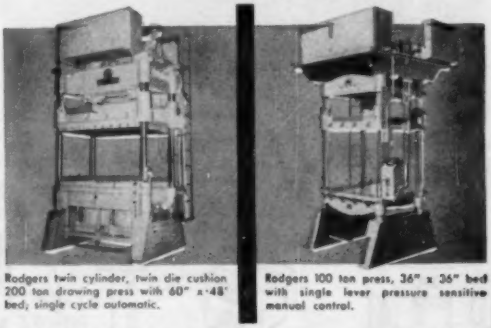
Rodgers Presses are designed and built by an organization with over 32 years' experience in high pressure hydraulics. They are available in capacities from 50 to 400 tons, single cylinder or twin cylinders, in many standard models for production or special uses. Where desired custom models will be designed to suit exacting special requirements.



Rodgers 100 ton 30" x 30" bed size with complete one cycle automatic control for deep drawing.

SEND FOR *NEW* CATALOG 337...

This new Rodgers Catalog has complete specifications, tables and data, making it simple to determine the press for the job. Write for your copy without obligation.



Rodgers twin cylinder, twin die cushion 200 ton drawing press with 60" x 48" bed; single cycle automatic.

Rodgers 100 ton press, 36" x 36" bed with single lever pressure sensitive manual control.

HYDRAULICS Rodgers KEEP THE WORLD MOVING

RODGERS HYDRAULIC, Inc.

Pioneers In High Pressure Hydraulics Since 1932

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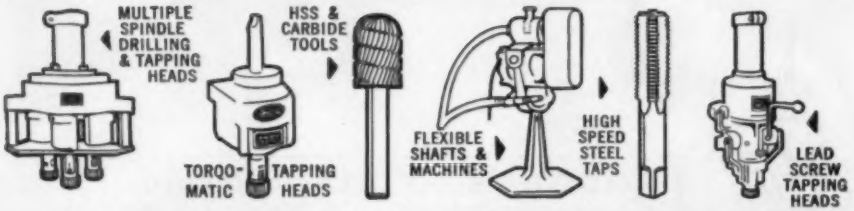
Drilling Versatility at Minimum Cost...
FITS ANY STANDARD DRILL PRESS
"SNAP-ON" JOINTS
2 TO 8 SPINDLES
ADJUSTABLE LOCATOR ARMS
UP TO 7/16" DRILL CAPACITY

Jarvis

Universal Joint MULTIPLE SPINDLE DRILLHEADS

Jarvis Universal Joint Multiple Spindle Drillheads are furnished in 3 standard models, with drill capacities from 3/16" to 7/16". Every unit has sealed-in lifetime lubrication to give you years of fast, dependable production.

Consult the Jarvis representative in your area for a complete analysis of your drilling requirements.


MULTIPLE SPINDLE DRILLING & TAPPING HEADS
HSS & CARBIDE TOOLS
TORQO-MATIC TAPPING HEADS
FLEXIBLE SHAFTS & MACHINES
HIGH SPEED STEEL TAPS
LEAD SCREW TAPPING HEADS

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BEARING ALUMINUM BARS

have you learned what **Bunting Bearing Aluminum Bars** can do for you?

No other low priced bearing metal delivers all the many fine qualities embodied in Bunting Bearing Aluminum. Its physical properties add up to a remarkable and ideal material for most general bearing applications. Light weight is an added advantage. It machines easily and rapidly, saving labor cost. All bars are machined on all surfaces, reducing waste metal to the minimum. And it is carried in stock in 138 sizes of 13" tubular and solid bars by your local Bunting Distributor.

case in point*

Specimens of Bunting Aluminum Bearings replacing bearings of other metals which cost twice as much. No sacrifice of performance or life.

1. Aluminum cuts cost of this big cylinder gland bearing. 2. You can machine aluminum to the most exacting tolerances. 3. Aluminum solid gear bearings cost less, weigh less. 4. Great economies in thick wall bearings.

MACHINE SHOP SERVICE . . . Small lots of special design bearings, not obtainable from stock, can be procured immediately from fully equipped machine shops through all Bunting Branches. The wide range of sizes of Bunting stock cast bronze and sintered bronze bearings makes the alteration of a stock item to a special bearing easy and economical. Bunting Cast and Sintered Bronze and Bunting Bearing Aluminum Bars provide the material for special sizes and designs which cannot be made from stock bearings. Your local Bunting Distributor can arrange for such work.

Ask for catalogs . . .

No. 158—Complete listing of sizes of Bunting Cast Bronze and Sintered Bronze Bearings and Bars, and Bunting Bearing Aluminum Bars. Pocket size edition.

No. 258—Complete listing of Cast Bronze Electric Motor Bearings for all makes and sizes of electric motors.

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The BUNTING Brass and Bronze Company • Toledo 1, Ohio
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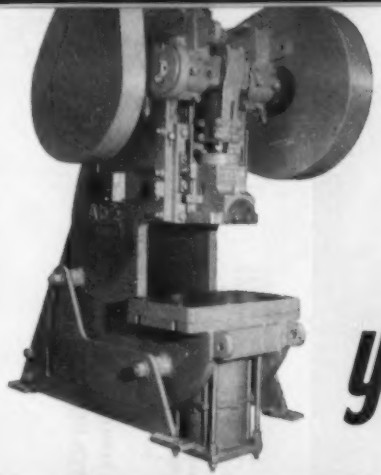

for grass roots economy

you just can't match this OBI

Cold, hard statistics leave no doubt. Wherever performance data and cost records are compared, the Series A Inclinable is way out front in parts produced per dollar expended.

On the most demanding jobs . . . where the clutch is engaged and disengaged at every press stroke . . . where three-shift operation continues day after day . . . *no OBI can even approach it in thrifty operation, fool-proof simplicity, and safety.* Readily understandable are the reasons why:

Niagara's famed, multi-point mechanical sleeve clutch picks up the load on 14 engaging jaws, applying the driving force concentrically without keys or pins. Instant engagement and maximum productive strokes per minute are assured.

There are no complicated electrical circuits, relays, limit switches or solenoids . . . no palm buttons, air valves or rotary air connections. In fact no air is consumed.

With fewer parts and simpler construction, there's less to go wrong, less to repair or replace. As a result, this is not only a more economical press to operate, but a much safer press as well. Records of thousands of presses are factual proof that the Niagara mechanical sleeve clutch is unequaled in safety and reliability.

Built in 13 standard sizes, with shaft diameters from 1¼" to 6½" and capacities from 5½ to 190 tons, Niagara Series A Presses can be readily equipped with numerous accessories for individual requirements.

GET THE FACTS AND FIGURES. WRITE FOR NEW BULLETIN 58N

NIAGARA

NIAGARA MACHINE AND TOOL WORKS • BUFFALO 11, N. Y. District Offices and Distributors Everywhere

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BOKUM OFFERS SERVICE AFTER SALE OF BORING TOOLS

Factory-sharpened Bokum boring tools every time *you* resharpen . . . that's what you get with your Bokum boring tools. You can maintain that extra precision over the lifetime of the tool with Bokum's new, low-cost Resharpening Fixtures . . . AB-1 for tool sizes No. 00000 to No. 3, AB-4-12 for sizes No. 4 to No. 12. They're easy to use, too. Compound angles required for correct resharpening are built into the Fixtures. A diamond dresser assures exact grinding wheel setting and a carbide-tipped stop locates the tool in proper position for grinding. Keep your tools factory fresh indefinitely.

Write Dept. H for Catalog Sheets AB-1 and AB-4-12 TODAY.

TRADE MARK REG. U. S. PAT. OFF.

BOKUM TOOL CO. INC. 14775 Wildemere Ave. Detroit 38, Mich.

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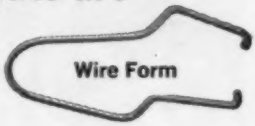
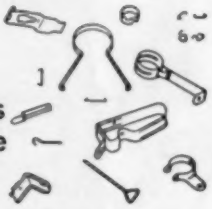
4 reasons why

Nilson Automatic 4-Slides are "Universal" Forming Machines



1. Form Wire or Ribbon Metal Stock
2. Accomodate Long or Short Pieces
3. Job Versatility through Quick-Change Cams
4. Combine Stamping & Forming in 1 Machine



Every Nilson Automatic 4-Slide is truly a "universal" forming machine, a machine designed to produce either wire forms or metal stampings at high production rates.

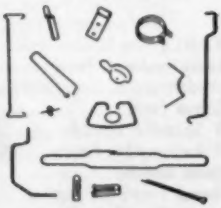
Open construction provides easy access to all tooling . . . permits rapid changeover from one stock to the other. And longer feeds, longer slide strokes give a Nilson the built-in ability to handle a wide range of work sizes—without special attachments or accessories.

For real efficiency in your pressroom, just pick the capacity you need from Nilson's 17 models of 4-slides! One of these versatile machines will make your stamping and forming operations faster, easier . . . and more profitable.

Write today for the Nilson General Catalog on Automatic 4-Slide Equipment

SIZE RANGES.
Wire up to ½" diameter
Ribbon stock to 3½" wide
Feeds up to 32"

5 TO 75 TON
PRESS SECTIONS



NILSON

THE A. H. NILSON MACHINE CO.

602 Bridgeport Avenue • Shelton, Conn.

AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

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MANEX High Speed Vertical Milling Machine

ALL CASTINGS ARE MADE OF MEEHANITE
Magnetic Clamp (Optional)
ALL GEARS OF CHROME NICKEL ALLOY
Cam Lock
Backlash Compensation on Longit. and Cross Feeds
SADDLE 30" Long
MANEX
Automatic Lubrication
Rapid Traverse
12 Selective Feeds Are Changed While Table Is In Motion

TABLE	36"-42"-48"
Longitudinal feed	26"-30"-38"
Width	10"
Cross feed	10"
8 Spindle speeds	75-2850 r.p.m.
3 Automatic feeds	.0015"-.003"-.006"
Quill travel	5"
Head traverse travel	13"
Motor for Spindle	2 H.P.
Motor for table feed	½ H.P.
Saddle	30"
Electro-pump	¼ H.P.
Maximum distance spindle to table	18"
Maximum distance spindle to column	25"
12 DIAL TYPE table feeds	7/16" to 19⅝"
RAPID TRAVERSE	100" p.m.
Micrometer depth stop graduated in .001"	
Large dials graduated in .001"	
Magnetic Clamp on motor stops spindle instantly.	
Motor and pully dynamically balanced.	
Net weight (approx.)	2750 Lbs.
Base	42" x 25"

MANEX MACHINERY CORPORATION
204 Central Park South • New York 19, New York

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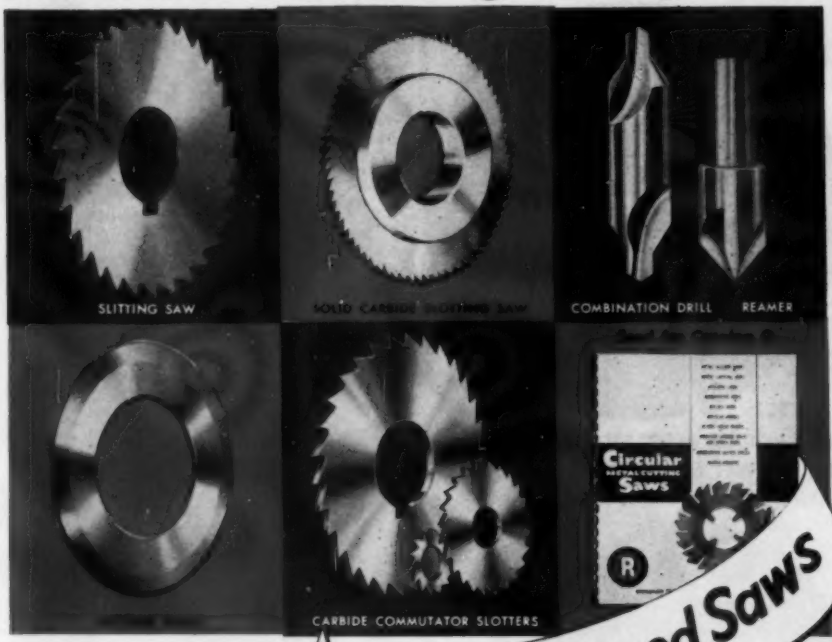
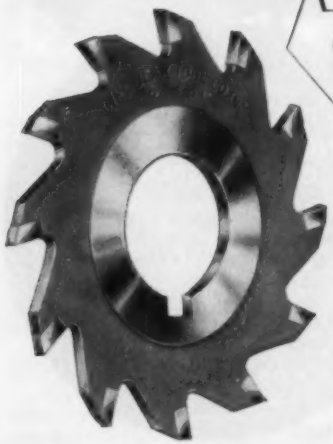
From More Than 1200 ® Catalog Items...



Carbide Tipped Saws

402-9



CIRCLE R carbide tipped saws — perfected by unique heat treating — increase production, *retain their tips.* Shown here is only one of many carbide tipped and solid tungsten types from our catalog of 1200-plus items. We also design special orders.

Consult a CIRCLE R *Specialist in . . .*

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CIRCULAR TOOL CO., INC.

PROVIDENCE 5, RHODE ISLAND

Specialists in Circular Cutting Tools Since 1923

METAL SLITTING SAWS • COPPER SLITTING SAWS • SCREW SLOTTING SAWS • COMMUTATOR SLOTTING SAWS • JEWELERS' SLOTTING SAWS • CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

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BRAND NEW!

SANFORD MG GRINDER and DUST COLLECTOR in a SINGLE COMPACT UNIT

MG GRINDER ALSO AVAILABLE FOR DRY OR WET GRINDING *WITHOUT DUST COLLECTOR*

The most widely used precision machine for unit grinding. Famous for its unsurpassed workmanship, quality and vibration-less operation. The MG is the grinder that's been "copied" but never equaled.

A COMPLETE DUST COLLECTOR INCORPORATED INTO GRINDER STAND.

- Exclusive design exhaust hood catches all sparks.
- Can be wired to grinder starter.
- Uses standard size filters—renewable or disposable type, or a combination of both.
- No outside exhaust needed.
- Saves floor space.
- Full size rear door gives access for cleanout.

PARTIAL SPECIFICATIONS

GRINDER: CAPACITY — 8" x 12" x 12". TABLE TRAVEL — 13", TRAVERSE 8¾". VERTICAL CLEARANCE — 12" under 7" wheel. STANDARD GRINDING WHEEL —7" x ½" x 1¼" hole. SPINDLE SPEED — 3000 RPM. MOTOR—½ HP, single or 3 phase TEBB dynamically balanced. FLOOR SPACE — 45" x 38". 62" high on floor stand. NET WEIGHT — 600 lbs.

DUST COLLECTOR: BUILT INTO GRINDER FLOOR STAND. EXHAUST CAPACITY—650 CFM. MOTOR — ½ HP, 3450 RPM, single or 3 phase. NET WEIGHT — 140 lbs.

SANFORD MANUFACTURING CORP.
1026 Commerce Ave., Union, N. J.

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Precision Ground Atrax SOLID CARBIDE TOOLS AND BURS

Job Applications

NEW ATRAX DIA-MO CUT IMPROVES BUR PERFORMANCE ON STAINLESS AND HEAT TREATED ALLOYS

A new type of cut that produces a tooth form with three cutting edges on each tooth has many advantages over conventional Diamond Cut burs.

EXCLUSIVE ATRAX DESIGN

By carefully controlling depth of flute, both left and right, and by engineering a definite ratio between the number of left and right flutes, a revolutionary bur cutting action results.

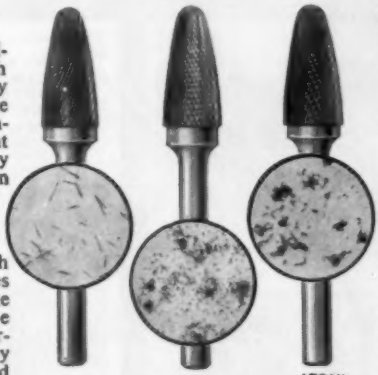
3 CUTTING EDGES

The chisel shaped tooth with three cutting edges produces a flake-like chip instead of the hard-to-control sliver-like chips produced by cuts ordinarily supplied on burs and the gritty, abrasive chips formed with the pyramidal type tooth on most Diamond Type cut burs.

LONGER TOOL LIFE

Cutting action is faster and more positive and tool life is longer even though this new type of cut has been shop tested on, and is recommended for cutting the toughest heat treated alloys and stainless steels.

Fine Cut bur (left) produces long sliver-like chips. Diamond Cut bur (center) produces sharp, abrasive chips. Atrax Dia-Mo Cut (right) produces flake-like chips—gives faster, smoother cutting action.



FINE CUT DIAMOND CUT ATRAX DIA-MO CUT

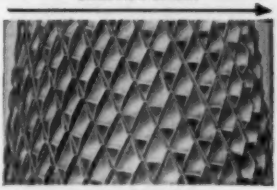
IMPROVED SURFACE FINISH

Surface finish after burring with the new Atrax Dia-Mo Cut is superior to that produced by a Diamond Cut bur making subsequent finishing, grinding and polishing operations much easier.

It is recommended that the new Dia-Mo Cut be operated at 1/3 to 1/2 the speed of conventional burs for most efficient cutting action and uniform surfaces.

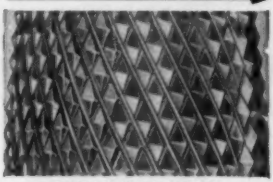
The new Atrax Dia-Mo Cut is available on request on 615 different bur sizes and types in standard, fine and coarse cuts.

DIRECTION OF CUT



DIA-MO CUT

DIRECTION OF CUT



DIAMOND CUT

NOTE three cutting edges take shearing-type cuts producing smooth surface finish

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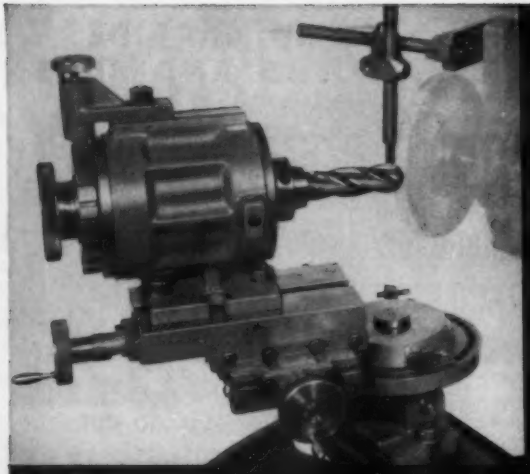

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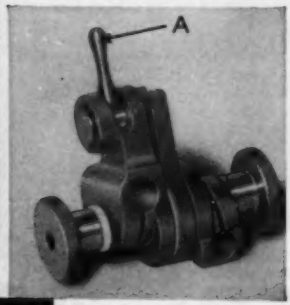

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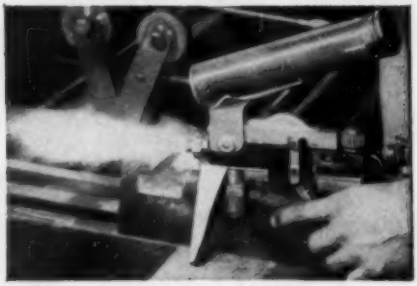

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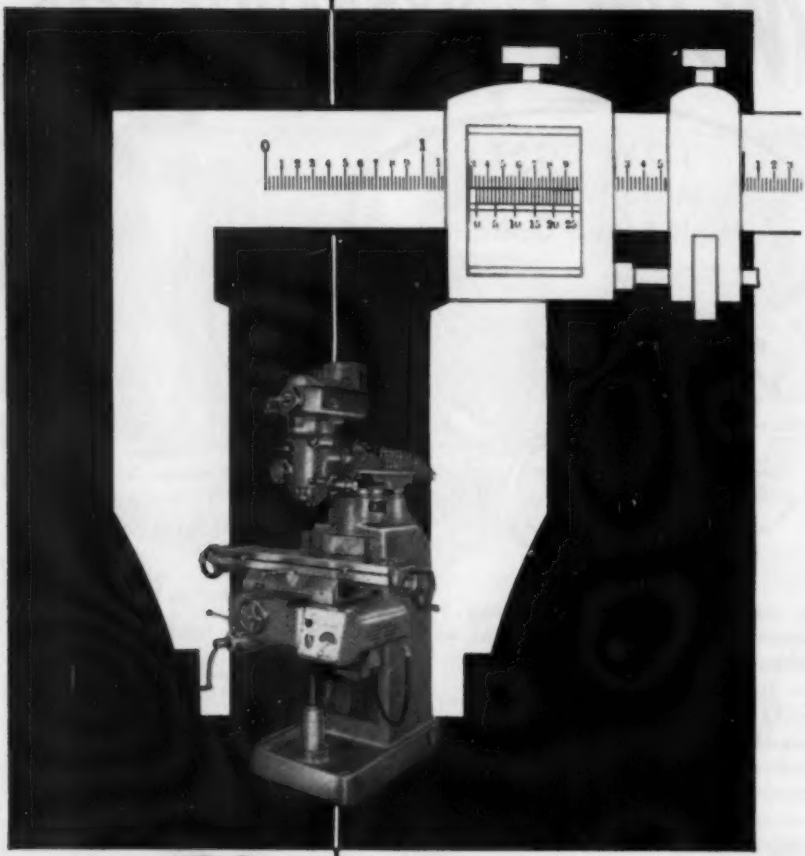

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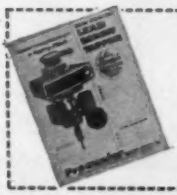

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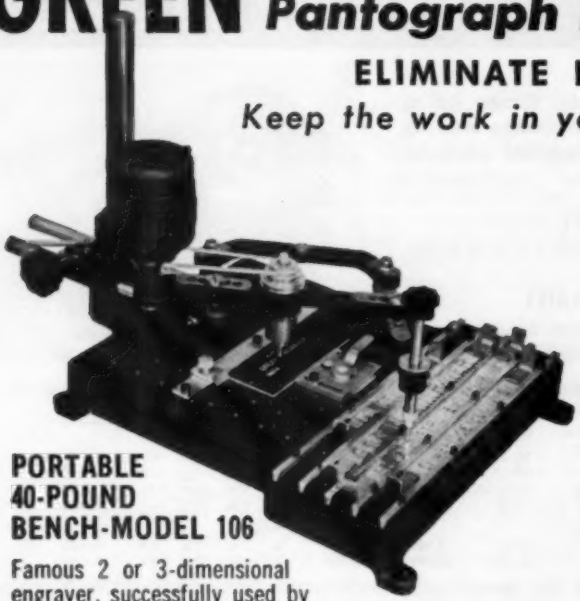

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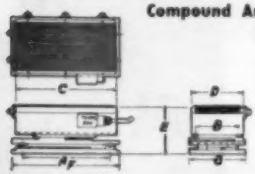
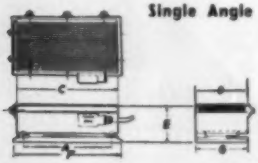


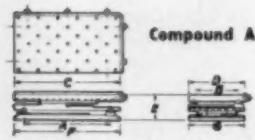
Compound Angle Sine Chuck

MODEL	(SINE) A	(SINE) B	C	D	E	F	G	PRICE
				ELECTRO-MAGNETIC				
DA-5	5.000	5.000	6½	6	5⅛	7¼	6½	$ 445.00
DA-10	10.000	5.000	11½	6	5⅛	12¼	6½	590.00
DA-1010	10.000	10.000	11½	10	5⅛	12¼	10½	1,180.00
DA-20	20.000	5.000	21½	6	5⅛	22¼	6½	1,400.00
				PERMANENT MAGNET				
DP-5	5.000	5.000	6	6	5⅛	7¼	6½	445.00
DP-10	10.000	5.000	12	6	5⅛	12¼	6½	590.00



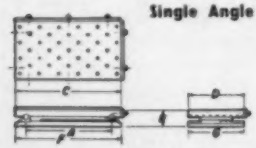
Single Angle Sine Chuck

MODEL	(SINE) A	C	D	E	F	G	PRICE
			ELECTRO-MAGNETIC				
SA-5	5.000	6½	6	4½	7¼	6½	$310.00
SA-10	10.000	11½	6	4⅛	12¼	6½	390.00
SA-1010	10.000	11½	10	4⅛	12¼	10½	775.00
SA-20	20.000	21½	6	4⅛	22¼	6½	950.00
			PERMANENT MAGNET				
SP-5	5.000	6	6	3¼	7¼	6½	310.00
SP-10	10.000	12	6	3⅛	12¼	6½	390.00



Compound Angle Sine Plate

MODEL	(SINE) A	(SINE) B	C	D	E	F	G	PRICE
DA-5P	5.000	5.000	6½	6½	3⅛	7¼	6½	$ 430.00
DA-10P	10.000	5.000	11½	6½	3⅛	12¼	6½	565.00
DA-1010P	10.000	10.000	11½	11	3⅛	12¼	11	1,050.00
DA-20P	20.000	5.000	21½	6½	3⅛	22¼	10½	1,350.00



Single Angle Sine Plate

MODEL	(SINE) A	C	D	E	F	G	PRICE
SA-5P	5.000	6½	6½	2¼	7¼	6½	$280.00
SA-10P	10.000	11½	6½	2¼	7¼	6½	380.00
SA-1010P	10.000	11½	11	2¼	12¼	11	750.00
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features in this issue

IT TAKES TEAMWORK TO CONTROL COSTS ON ROCKET ENGINES—An interview with Ross Clark, Plant Manager of Rocketdyne. Several interesting programs are in operation at Rocketdyne which help in the control of costs: RAMAC, Random Access Memory Accounting Control and DPR, Department Performance Rating. While these systems are discussed but briefly, they give an idea of how costs are being controlled in the rocket field ..... **Page 101**

CREATIVE ENGINEERING for this month is devoted to several interesting aspects. Harry Conn, in Engineering and Tooling, discusses Drilling Compromises from the standpoint of drill point angle and its effect on drill life . . . Paul Prikos, the Practical Diemaker, explains the construction and estimating of a Progressive Die From a Strip Layout . . . Allan Young, in Process Engineering, is concerned with the Tool Expediting Department, Its Function and Service . . . The Cutting Tool column is devoted to some Simple Rules Which Increase Grinding Efficiency. ..... **Pages 79 to 91**

FORM GRINDING OF JET BLADES—An interesting article showing the use of a diamond, preformed wheel dresser, which imparts a form to the grinding wheel and which, in turn, imparts the form to the jet blades. Methods used and the types of wheels which are formed, are outlined. ..... **Page 109**

ADAPTING ASSEMBLY TO MULTIPLE PRODUCT LINES—This is a riveting case history and shows how riveting can be an aid in the assembly of products, especially where the products are mixed on the line and many different kinds of parts must be assembled. ..... **Page 112**

WHICH THREAD . . . COARSE OR FINE? Bill Waltermire of the Lamson and Sessions Co. describes many tests on torque involving coarse and fine threads and comes to some definite conclusions regarding which thread to use and on which application. ..... **Page 116**

THIS COMMITTEE GETS ACTION AT HOTPOINT, by Darrell Ward. BLUE BOOK'S engineering editor spent some time attending a daily production meeting at Hotpoint. At a time when committees are flourishing like weeds it is refreshing to encounter one that actually gets work done and performs in a highly efficient manner. Rules for the success of Hotpoint's committee meeting, which can be adapted by other manufacturers, are clearly stated. A worthwhile article for all who are interested in communications. ..... **Page 130**

its specifications add up to high production capacity

Logan 14" Lathe

Logan No. 6565 14" Lathe

Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-capacity features. For instance—

- An oversize spindle with 1⅝" bore turns on four super-precision ball bearings with built-in preload
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- 9" swing over saddle cross slide
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2

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- ***Chasm between engineering and production***
- ***Need more diemakers***

■ "Many engineers should spend some time on the production line," says Ronnie Burritt, factory manager of J. J. Tourek. "We get prints in here and jobs to be quoted on that convince me that many of our new engineers should take a turn at handling a machine, then they wouldn't make such ridiculous requests. For instance, they do not seem to know that production milling has certain tolerance limits, and that to get finer tolerances requires the use of grinding or expensive broaching tooling, assuming the run is short. This additional operation ups their costs considerably; yet, when questioned about it they do not really care about the finer tolerance and will accept our recommendations. This is particularly true of surface finish. When you get down to 5 or 10 or 15 rms you're dealing with expensive work; most of the time such fine finishes are unnecessary, but the engineers request them. When told of the expense, they at once see the sense of it and change the specs. I do not mean to imply that engineers are stupid, or silly, far from it; I do not want to give that impression. I think the companies are at fault for hiring well-trained—in theoretical knowledge—engineers and then assume that they know all about production techniques. Companies should send their engineers on the floor for a period of six or more

months to work with the production people. They would be better engineers for it."

We have heard similar opinions voiced by others. What bothers us is this: there appears to be a growing chasm between the engineers and the production people. Graduates do not seem to want to work in production. Engineering has more glamour. This is another area worthy of some attention: Are we training production people, or are we dismissing production as old stuff? Are we placing our faith in engineering at the expense of production? Let me give an illustration. The production people are interested in removing metal. Production rates, tool life, tool wear, downtime, etc., these are the real and hard problems. Machine efficiency, machine wear, loss of accuracy and the proper functioning of hydraulic and electrical systems are of prime concern. To take the case of numerical control, whether you have tape or not, tool wear, metal removal rates, costs, accuracy, etc. are still the prime concern of the production people. It is the backbone of the entire operation. The engineer, however, looks on numerical control quite frequently as a purely objective engineering problem, concerning himself with the cost of the equipment, and the engineering of it, and only rarely with the practical aspects. With or without tape tools wear, accuracy is lost; you may locate the hole but you don't drill a straighter hole because you have tape. The chasm in thinking is here quite pronounced and I hate to see engineers forget production problems, or look down their noses at practical production and think only in terms of theoretical and objective engineering.

■ Ray Becker, of Prikos & Becker Tool Co., stopped in the office the other day to chat about diemaking. Incidentally, Paul Prikos, his partner, is the same whose column appears monthly in this magazine under the heading, The Practical Diemaker. Ray was perturbed, as are all the tool and diemakers, with the training of future diemakers. "It's almost impossible to get a good man these days," he said. "There are simply no diemakers around. They're scarce, and becoming scarcer. The country is not training diemakers with the speed and thoroughness that it should." When we asked Ray who was to blame, he said, "You really can't blame industry or the union, although, I suppose, it is fashionable to do so, but you must blame the young men themselves. They simply do not want to start a long training period at a salary range that is below that which they could make as, let's say, a truck driver. Many of them feel that once they have graduated from an apprentice course they still would not make enough money to have made the time spent in training worth the pay-off. A production worker, with a strong union behind him, can earn almost as much as a diemaker."

Prikos & Becker have always believed in a strong apprentice program, and constantly have two or three apprentices in training. In 1958 one of their apprentices was named Apprentice of the Year, testimony to excellent training. • • •

CUTTING TOOLS

SIMPLE RULES INCREASE YOUR GRINDING EFFICIENCY*

■ There has been a great deal of needless mystery about the grinding wheel and grinding operations in general. With the many different combinations which are possible in a grinding wheel, i.e. the grain, hardness, spacing, size, and bond, and using these various combinations on hundreds of types of metals and on different machines, it is not difficult to understand that grinding might be termed difficult. However, it need not be difficult, nor need it be a mystery. With the help of but a few fundamental principles, when understood properly, grinding can become simple indeed. For instance, the basic principle of grinding requires a wheel to break down in order to grind. The rate of breakdown controls the performance and economy of the operation.

In grinding there are millions of little grits acting as cutters. It is a true metal cutting operation in that metal chips are actually removed during grinding. Grinding grits do not abrade, or wear away the surface of a workpiece, but form chips which are similar to basic chip types found in other metal cutting processes.

The grinding wheel is, in theory and to some extent in practice, self sharpening. Grains fracture and present new cutting edges before the old ones are too dull, or when

badly worn down they are torn out of their setting and so allow other grains to come into play.

When an abrasive grain starts to enter and penetrate the work, the depth of cut is zero. As the wheel and the work revolve, the depth of cut gradually increases to a maximum somewhere along the arc of contact and since the wheel usually rotates much faster than the work, the greatest depth of cut is very near the spot where the wheel leaves the work. This greatest depth is called the grain depth of cut. From the grain depth of cut we can list the following facts relating to wheel action during cutting, other factors being the same:

1. Increase of work speed increases grain depth of cut and makes the wheel appear softer.
2. Decrease of work speed has the opposite effect.
3. Increase of wheel speed decreases grain depth of cut and makes the wheel appear harder.
4. Decrease of wheel speed increases grain depth of cut and makes the wheel appear softer.
5. Reducing diameter of grinding wheel increase grain depth of cut and makes wheel appear softer.
6. Increasing diameter of grinding wheel reduces grain depth of cut and makes wheel appear harder.
7. If the work diameter is reduced, the grain depth of cut increases and makes wheel appear softer.
8. If the work diameter is increased, the grain depth of cut decreases and makes wheel appear harder.
9. For rapid stock removal when finish is no object use a large grain coarse grit size in an open structure.
10. For finish grinding use fine grit sizes.
11. When grinding soft materials use coarse grit sizes.
12. When grinding hard materials use fine grit sizes.
13. There may be operations which require some adjustments to these principles but they hold true for general over-all usage.

This article is based on the revised (1959) edition of the textbook, The Grinding Wheel, published by the Grinding Wheel Institute, Cleveland, Ohio.

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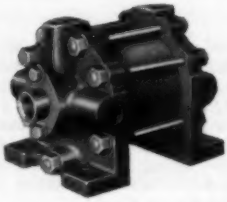

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4

CREATIVE ENGINEERING

PROCESS ENGINEERING

THE TOOL EXPEDITING DEPARTMENT... ITS FUNCTION AND SERVICES

■ As a follow through on any tool processing function, the status of all the tools involved must be known at any given time to aid in scheduling parts for manufacture using these tools. Since this is too extensive a responsibility to be handled by the tool process engineers, who determine the need for, and procure the tools, a tool expediting section must exist to maintain a running record of all tools in the process of being obtained. This department not only sees to it that tools are delivered on their specified delivery dates, but also furnishes tryout stock to tool vendors, assures the inspection of tools and parts by the inspection department, and notifies the tool builder of discrepancies, and the acceptance of the tools when they pass inspection. Rework of tools because of revisions of the parts is also initiated by this department.

This up-to-date information is kept on a tool expediting log card such as that illustrated. Four identical cards are made out and filed in four separate files under the major entries at the top of the card; Part Number, Completion Date, Manufacturing Production Order Number (MPO), and Tool Manufacturer. Consequently, current information can be obtained from these lines as follows.

(a) Status of tooling on any particular part can be seen at a glance.

(b) All the tools due on a given date can be listed, allowing a delinquent tool sheet to be compiled every week.

(c) The status of all tooling for a particular MPO can be obtained to aid in scheduling parts for manufacture.

(d) The tooling situation, for our own work, can be checked at any one vendor to determine his shop load, promptness of his deliveries, and whether or not he can take on additional tooling at any particular time.

Since many operations can be performed on most parts prior to the time when the use of the tools most occur, the status of the tools must be known by the planning and scheduling department to allow them to schedule these preliminary operations, rather than wait for receipt of all the tools before production begins.

The card is marked for identification for each file by placing a check mark, usually in red pencil, in the corresponding block by the major entry at the top of the card. The card illustrated is for the MPO file.

The information on the card, by columns, lists all the tools needed to produce the part, a description of each tool, the order number (which may be a purchase order number if built by a vendor, or a job order number if built by our own tool-room), the date of receipt of the tool (or completion date if the vendor is to produce the first order of parts), the receiving report number, and the date the tool is inspected and approved. The "short sheet" column indicates whether or not the part to be produced by these tools is delinquent, but this is seldom used since a delinquent tool list is compiled each week, and expediting action is taken. This list is taken from the "completion date" file.

To sum up, the tool expediting department is also a records section in essence, because this is the only location of a running record of the status of tooling, with all current information readily available.

The importance of this function is not to be overlooked, because this department services the whole manufacturing operation from a tooling standpoint, including the processing, methods, planning, and fabricating departments, and this section is the only one in the plant which has this badly needed information. • • •

☐ PART NO. 516 1257 004 ☐ COMP. DATE 3/15/60 ☑ M P O 6050

☐ MFGR. D.C. JONES TOOL CO. 1 OF 1

TOOL NO.	DESCRIPTION	SHORT SHEET	ORDER NO.	DATE REC. OR COMP	R.R. NO.	DATE INSP. O.K.
113 1041 00	Pierce & Blank Die		C-565310			
113 1041 00	Drill Jig #1		C-565310			
113 1042 00	Drill Jig #2		C-565310			
113 1043 00	Form Die		C-565310			

P-307 (Rev. 2-58) EXPEDITING LOG - TOOLS & DIES

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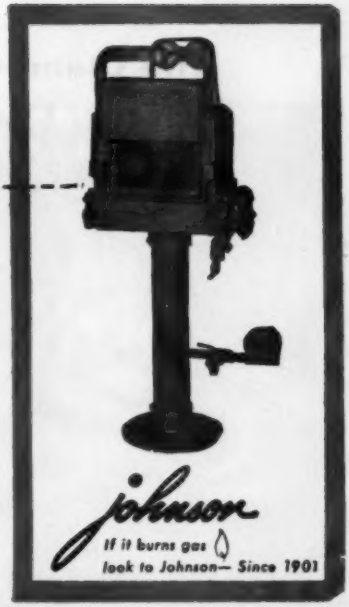

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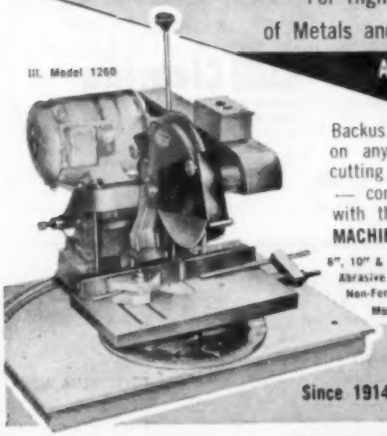

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By **Paul Prikos**
Prikos & Becker Tool Co.

THE PRACTICAL DIEMAKER

ESTIMATING A PROGRESSIVE DIE FROM A STRIP-LAYOUT

■ Thus far we have estimated dies from the piece-part drawing, with a partial die view to illustrate the estimate. In estimating a piece-part that requires a progressive die requiring certain notches, cut-outs and forms, we need not have any die drawing. The estimator will usually sketch a strip for himself, leaving off all the refinements until the order is given for the actual design and build of the die. I have found that to be safe in visualizing the number of stations required, cut-outs, etc., it is best to first take a piece of tracing paper and trace the outline of the piece-part drawing, flipping the tracing paper around to all views so that you finally have a flat layout of the blank. From this, usually at the bottom of the new tracing, make the estimate and in free-hand lay out the progression or multiple of the die. It need not be proportionate, only to exemplify the piercing, piloting, notching, forming and blank or cut-off requirements. Then underneath each station add the hours as shown in figures 1 and 2.

Usually I never generalize the progressive die estimate without a breakdown of the stations.

The risk is too great and only a minimum "guestimate" is permissible.

The estimate for the above die is as follows:

1.	French Stop	20.0
2.	Notch	60.0
3.	Perf (one round, one elongated)	15.0
4.	Perf (one round)	10.0
5.	Notch (two sizes)	40.0
6.	Cut-off	10.0
	Form	35.0
		190.0
	Assembly	40.0
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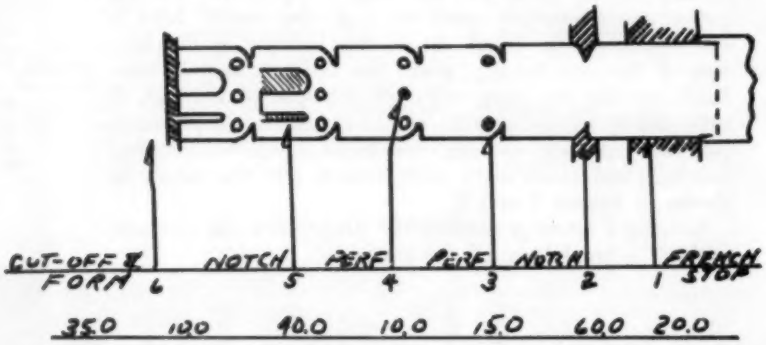
1—Piece part.

You will notice that the way this estimate is made is different from before. We take each part and figure it through the die. By this is meant for a perforator we give five hours. Any diemaker knows a perforator ½" diameter by 2" long shouldn't take more than ¾ of an hour to make, perhaps

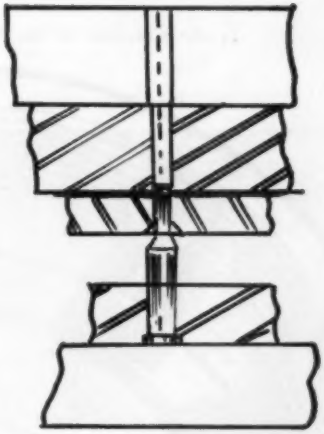


2—Strip part.

½ an hour, including turning and grinding. But here we give five hours, that includes the complete work of punch pad and jig boring, die block and jig boring, and taper reaming, stripper work and die shoe opening. We estimate each working part completely through a die cross-section, figure 3.

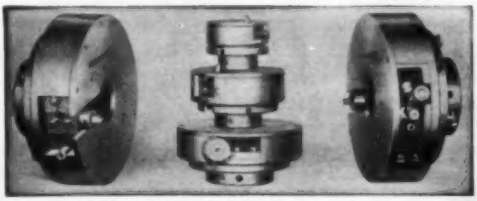
At the end of the estimate you will notice the additional hours for assembly. Here is the weakest part of the estimate because again we rely on different diemakers' ability to make a clean sweep of the die. Many diemakers will have all the components finished for the die, but cannot seem to assemble and transfer onto the die set with a degree of certainty, or, even if assembled, will be in and out of the tryout-press constantly assembling and disassembling the die to make adjustments. On a general run of progressive dies the diemaker should have the die pretty well licked before going into the tryout-press and with a minimum of adjustments remaining, finishing the debugging in short order.

Here then is the problem, namely, the assembly estimate is difficult to correctly ascertain. Usually I figure progressive dies right "on" without too much cushion. My reasoning is that a progressive die, if designed completely, goes through the jig bore



3—Cross section.

which is very accurate and positions the openings for the diemaker. Grinding is a big part of the die and that, too, is a very accurate and easy means of producing size and contour. Comparators, shadow graphs, and other quick measuring instruments are readily available in a properly equipped shop. For these reasons failure in the diemaking of a progressive die is greatly reduced due to the new types of machinery. Naturally the diemakers' skill is required to make the die work—but that is precisely why diemaking is the hierarchy of craftsmen. • • •



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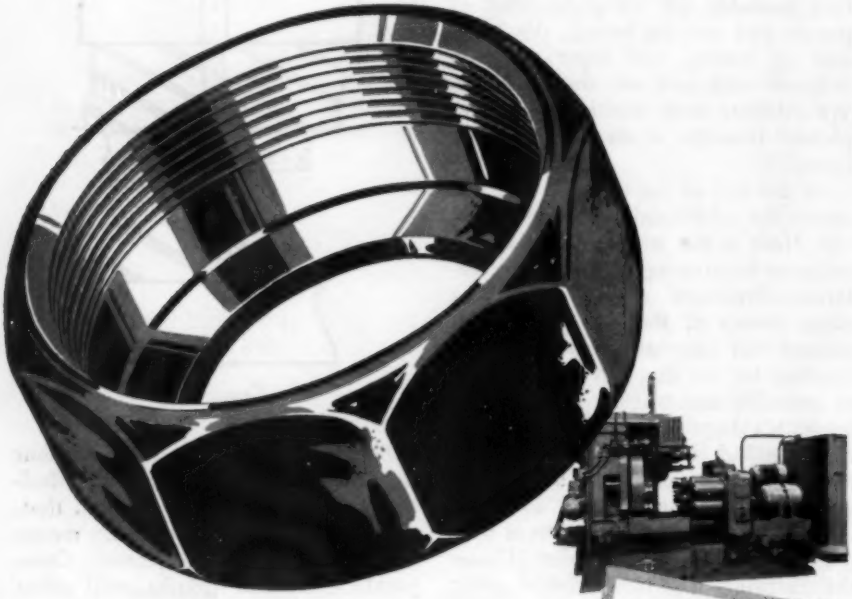

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ENGINEERING and TOOLING

DRILLING COMPROMISES

What effect does point angle have on drill life?

■ It has often been said that the most efficient machining operation is a series of compromises. It has been known for about sixty years that cutting tool life is affected most by speed, then feed per revolution and the least by depth of cut. However, at this particular time enlightened tool and methods engineers are more concerned about low unit cost instead of low tool cost. The tool engineer that strives for the lowest cutting tool cost instead of the lowest unit cost is properly plotting a straight line to the poor house.

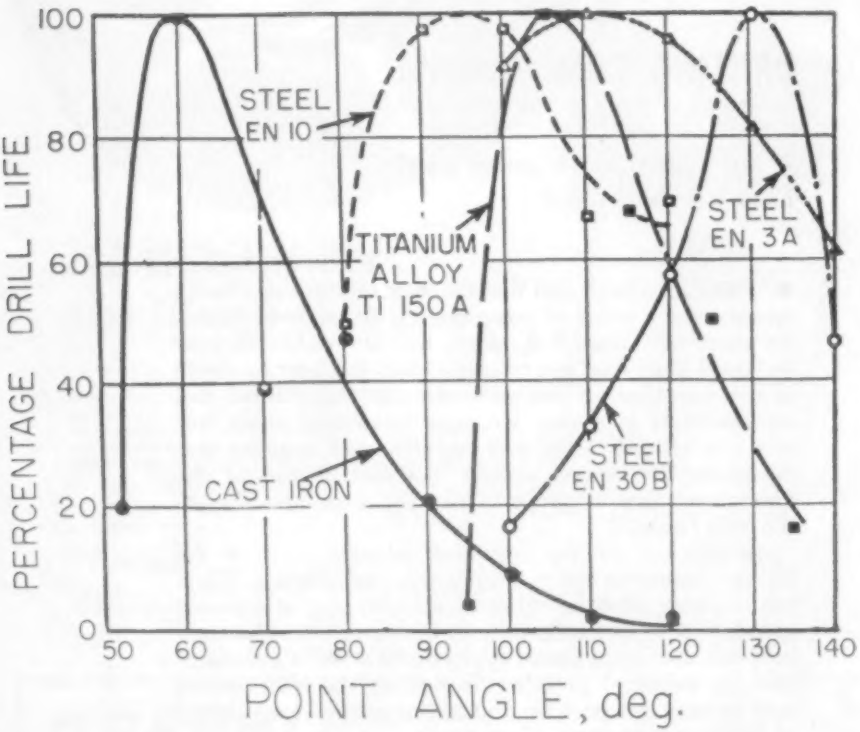
An efficient drilling operation whether it is of the transfer variety or not is often a wise compromise. When you see many drills of different sizes running at different speeds and feeds successfully in the same head the compromises sometimes almost approximate those of a modernistic (in theology) preacher. In drilling, the compromises may or may not be wise due to the engineering ability of the engineer, in theology compromise is never wise.

In the previous article it was shown how the amount of feed per revolution affected the amount of thrust and

torque. If thrust forces were too high the amount could be varied by changing the feed. The same cause and effect relationship of feed and torque was shown for several materials. The effect that the point angle has upon torque, thrust or tool life was not mentioned.

The effect that the point angle has upon drill life is shown for several materials in figure 1. These particular tests were run by the Production Engineering Research Association of Great Britain. The point angle for the best drill life for each material may be determined very easily. Simply project downward from the highest point on any curve to the base line and read the indicated point angle.

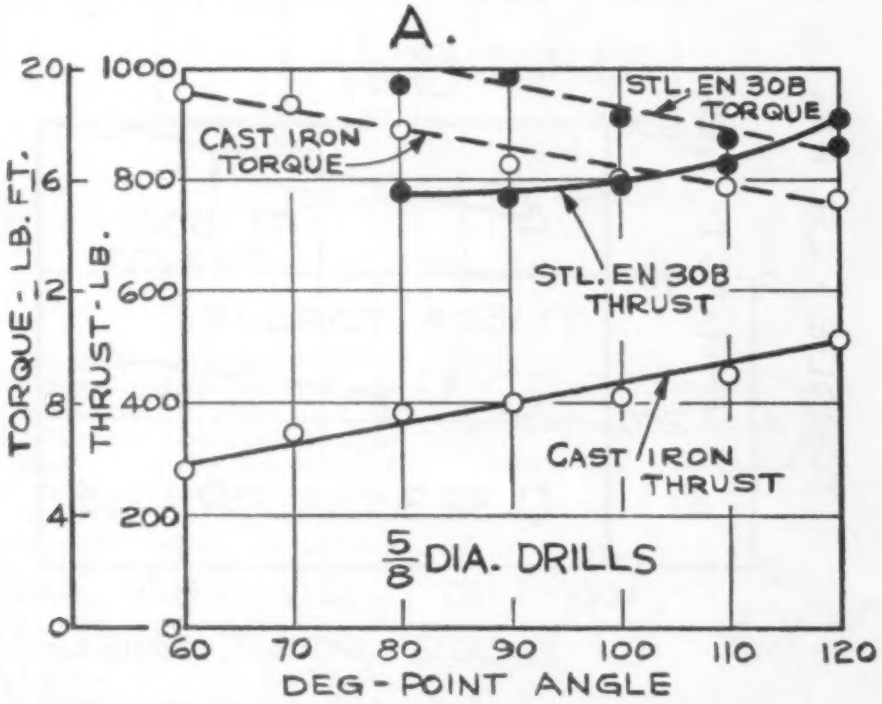
The optimum point angle in degrees for cast iron shows 60°. This is an astounding difference from what is used in this country. The amazing difference in drill life for point angles



1—The effect of the point angle upon drill life is shown for several materials.

Material Drilled	Drill Dia. in.	Helix angle Deg.	Relief Angle Deg.	Speed r.p.m.	Feed in./rev.	Cutting Fluid
Cast Iron	5/8	28	10.1/2	940	0.010	None
Steel En 10	5/8	28	10.1/2	1,380	0.010	Soluble Oil
Steel En 3A	5/8	28	10.1/2	1,210	0.010	Soluble Oil
Steel En 30B	5/8	28	10.1/2	387	0.010	Soluble Oil
Ti 150A	0.323	25	12	760	0.0014	Soluble Oil

2—Drilling conditions for various types of materials.



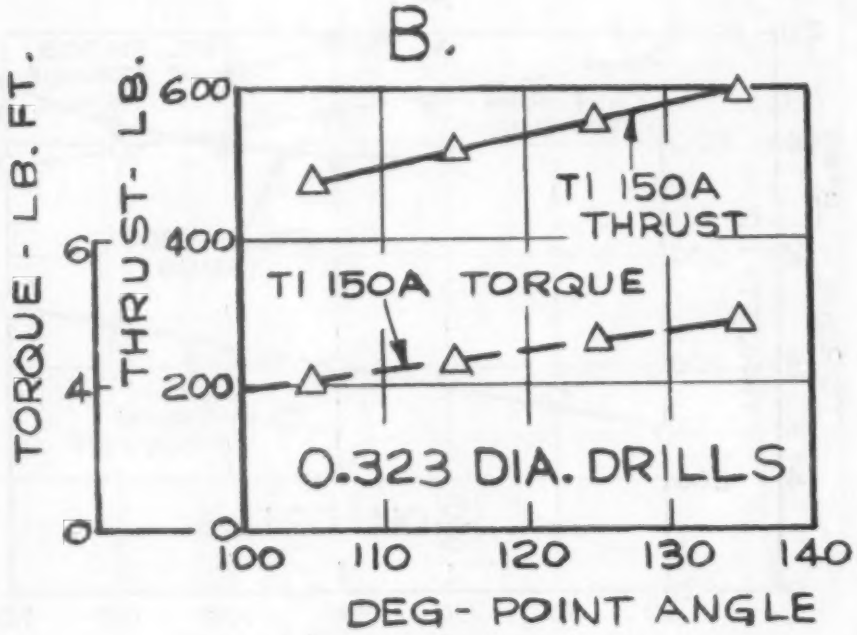
3A—Effect of point angle on torque and thrust in various materials.

of 100° and 60° in cast iron is worthy of personal investigation by concerned tool engineers.

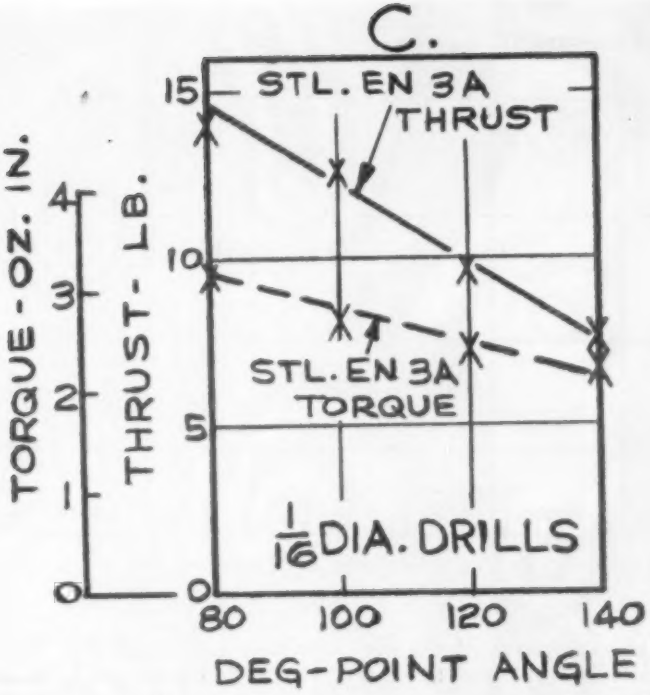
The explanation for greater tool life of the 60 degree angle is the same as the wide brake band over the narrow brake band. It is also the same effect of a larger side cutting edge angle in single point cutting. It causes a thinner chip and more area is doing the cutting.

The best drill life was obtained in cast iron with a point angle of 60 degrees at high speeds and moderate feeds. A point angle of 80 degrees at lower feeds and speeds in tough iron was found to be best. A tabulation of the drilling conditions for the various materials of figure 1 are shown in figure 2.

If there are many drills being used at one time and if the workpiece is of flimsy or unstable characteristics, too heavy thrust loads may present a real problem. It is then mandatory that the feed per revolution be decreased or the included point angle be reduced providing the angle is higher than the optimum point angle for a given material.

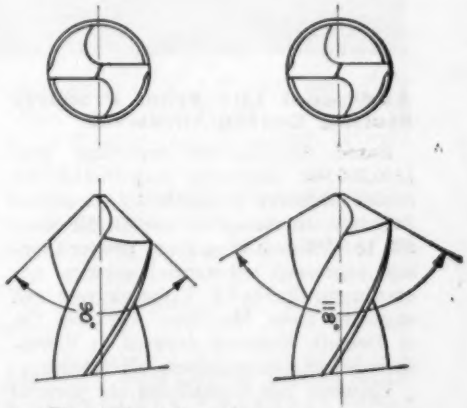


3B—Effect of point angle on torque and thrust in various materials.



3C—Effect of point angle on torque and thrust in various materials.

The data shown in figure 3A shows the torque-thrust relationship for 5/8 diameter drills for various point angles. This seems to defy ordinary logic, because it is usually thought that if the thrust is reduced the torque also should show lower values as the Titanium Alloy actually did in figure 3B. However, for small drills such as 1/16 in diameter the effect of point angle upon torque and thrust is quite different when drilling steel as shown in Figure 3C. If the holes being drilled are through holes the thrust forces must be seriously considered due to its effect upon drill life and breakage.



4—The drill point angle.

Material Drilled	Drill Dia. in.	Helix Angle Deg.	Point Angle Deg.	Speed r.p.m.	Feed In./rev.	Cutting Fluid
Cast Iron	5/8	28	60	940	0.010	None
Steel En 30B	5/8	28	130	387	0.010	Soluble Oil
Ti 150A	0.323	25	115	760	0.0014	Soluble Oil

5—Drilling speeds, feeds, angles, coolants, etc. for figures 3A and 3B.

The graphs and charts of the previous article when used with the data in this article should enable the engineer to eliminate tool breakage, premature drilling, overloading, part distortion. Thrust and horsepower calculations should be easier and more accurately calculated also.

The drill point angle is shown in figure 4, and the difference between 118° and 90°. The drilling speeds, feeds, angles, coolants, etc. for figure 3A and 3B are shown in the table in figure 5. • • •

Additional Life From Properly Storing Coated-Abrasives

Based on figures reporting over $100,000,000 annually expended on coated-abrasive products by American industry, increases in useful life from 5% to 75% resulting from proper storage represent substantial savings, according to Richard P. Villwock, research engineer from Michigan Abrasive Co. of Detroit. Extreme dryness or dampness affect the products adversely.

Villwock has formulated six general rules which can be employed for obtaining maximum performance from coated-abrasives, as follows:

(1) Keep temperature around 70° F with relative humidity at 35% to 50%. (2) Keep cartons off the floor to prevent moisture pickup from damp floors. (3) Store opened boxes flat on shelves, so as not to damage edges. ((4) Open cartons only as needed. (5) Rotate stock; use older shipment first. (6) Hang used belts on level hangers to prevent edge damage, and keep pegs or hangers as wide as practical to prevent damaging the backing or bond.

THREADING AT 581 R.P.M.

Suburban Industries, Bensenville, Ill., is achieving these results with a LANDMACO 5C Threading Machine equipped with a 5/8" VVV LANCO Hardened and Ground Die Head. Both steel studs and continuously-threaded bars are produced at 581 r.p.m.

Chaser life is excellent. For example: 10,000 studs of B 1113 steel, having a 1/2" UN thread 3/4" in length, are produced between chaser grinds. In the rod application, with 1/2" 13 pitch UN threads in 12-foot lengths, 150 bars of B 1113 steel are produced between chaser grinds.

The 5C LANDMACO Machine is manufactured in a single-spindle model for threading all diameters from 3/16" to 5/8" to Class 4 fit. Lead screw and air-operated equipment available to increase machine efficiency. 519

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...for either inside or outside cuts

...with no distortion of material—no internal strains —no invisible fractures—no burr

...with a "nibbled" edge that is sufficiently smooth to require very little finishing and sometimes none

CAMPBELL standard punches are made double end to double work life and halve the cost. Prices are so low (starting at 40c each, or 20c per working end) that new punches cost less than regrinding dull ones.

Here is a quick picture of CAMPBELL NIBBLING MACHINE Capacities

Campbell Nibbler Model #	Sheet Width	WORKING CAPACITY Sheet Thickness Mild Steel	Alloy Steel	Strokes per Minute
0	16"	3/32"	1/16"	900
1A	20"	3/16"	1/8"	375-650
430	60"	3/8"	1/4"	350-525
436	72"	3/8"	1/4"	350-525
530	60"	1/2"	5/16"	350-525
2524	48"	1/4"	3/16"	375-650
2536	72"	1/4"	3/16"	375-650

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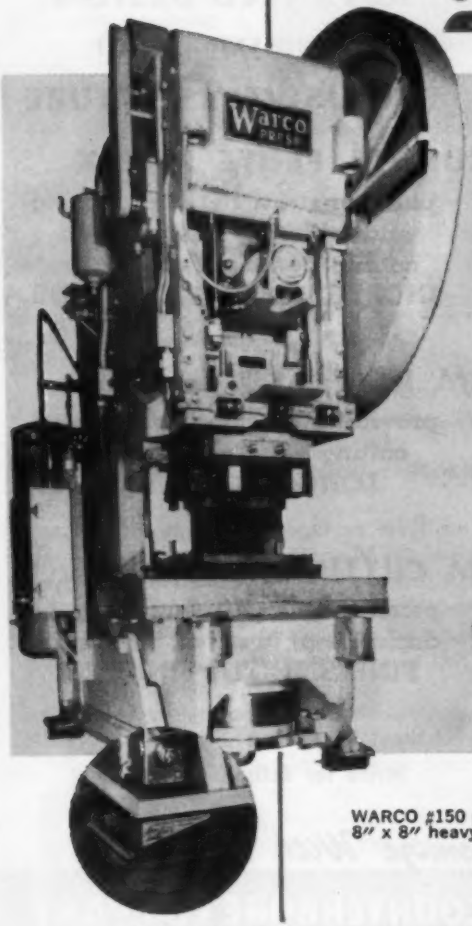

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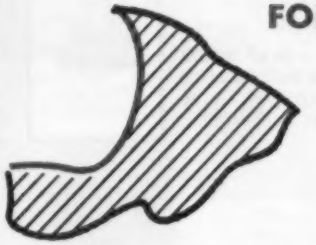

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"Everyone in this work is faced with increasing reliability requirements, decreasing lead times, and a tightening rein on costs." Ross Clark, Plant Manager, Rocketdyne.

It takes teamwork to

Control Costs on Rocket Engines

says **Ross Clark,** Plant Manager of Rocketdyne, a Div. of North American Aviation, Inc. in an interview with **Matt E. Heuertz,** Hitchcock Publishing Co.

Q. *Mr. Clark, with the spotlight so much on the rockets and missiles these days, many of our readers in other industries would like to see the veil lifted from some of the processes being used at companies such as Rocketdyne. There is a feeling that many of these new techniques could be adapted in the manufacturing of consumer durable goods.*

A. Any so-called secret processes we are using are simply the result of the efforts of our team here at Canoga Park. With virtually no backlog of know-how in the field, and no one to lead the way, we have had to develop and refine manufacturing techniques as we go. Many of the processes we have developed are now being licensed.

Q. *Before we get down to some specifics about your operations, would you mind telling what is the biggest problem you face?*

A. We have the same problem in the rocket engine field that exists in the complete missile manufacturing field.

Everyone in this work is faced with increasing reliability requirements, decreasing lead times, and a tightening rein on costs. The whole matter is complicated by a growing demand on components as rocket engines perform at higher specific thrust values with less weight.

Q. *Such a dilemma would be eliminated in the average company by either lengthening the lead time on new products, or perhaps sacrificing a little reliability. How about at Rocketdyne?*

A. With no choice but to resolve this dilemma, we have had to come up with refinements in all phases of our operations—from engineering right on through the production of working models. Everything possible is done to cut costs while turning out highly reliable rocket engines. It takes team work to control costs on high thrust rocket engines.

Q. *Let's start with production control. What are you doing to control costs here?*

A. Our most important control device here is the RAMAC system. RAMAC is the nickname for "Random Access Memory Accounting Control." With this system we can store up to 10,000,000 pieces of information in two memory banks. You can realize how time-saving it is when you consider that it takes only a few seconds to get any type of stored-up information. Normally, it would take a group many hours of work to develop this information. Of course, RAMAC is also valuable in other phases of our operations. For instance, our production facility at Neosho, Missouri, can tap the memory machine for certain production information in just a matter of minutes.

Q. *How much has RAMAC contributed to cost reduction?*

About Ross Clark

Ross Clark's career spans three decades of manufacturing operations with North American Aviation. Starting with sheet metal assembly work in 1938, he became a fuselage assembly leadman and then a fuselage assembly foreman in 1941. General foremanship responsibility became his in 1942.

In 1949 he was promoted to project superintendent for the F-86 Sabre Jet, and the next year was named manufacturing superintendent. He transferred to the company's Propulsion Center in 1954 as superintendent of manufacturing, the position he held until the establishment of the Rocketdyne division as a separate unit in 1955, and he assumed the position of Factory Manager. In January 1960, Clark was named Plant Manager for the Rocketdyne operations in Canoga Park, California.

A. Over-all, it's hard to say, but in production control alone it has effected a 15% reduction in costs.

Q. *What other control measures do you employ?*

A. Another important measure that touches every phase of our operations is our "Process Control System." When a new product is brought into Canoga Park, we get our most skilled production personnel together at once. This includes foremen, inspectors, tool designers, methods engineers, value analysts, etc. Their job is to decide the best way to make a new rocket engine.

Once they have reached a decision, we develop as soon as possible a packaged component in which all the necessary equipment and machinery are placed together so that the parts and personnel can be controlled in relation to each other. Concurrent planning and tooling parallel the design as it progresses, so that all parts, components and systems have the maximum opportunity for early testing if required, thereby increasing reliability.

Q. *Let's go to the production level. What measures are employed here to help control costs?*

A. At this level we have evolved a DPR system. DPR stands for "Department Performance Rating." This system, we have found, instills a keenly competitive spirit between all production departments. The aim is to help produce a quality product, on schedule, and at a reasonable cost.

Q. *Briefly, how does your DPR system work?*

A. In any given work period, each department works toward the goal of accumulating a maximum of 100 points. Nine facets of production are considered, namely: direct hours, scheduling, production control, rework, supporting labor, lost time, safety, housekeeping, and non-productive material. The department coming out with the most points is given an "Award of Merit," with special citations going to that department's foremen, assistant foremen, supervisors and lead men.

"With ever-changing designs we need great flexibility in our equipment."

"Cost-plus is a thing of the past; we can now deliver rocket engines on a fixed-price basis." (at Rocketdyne)

Q. ***This could get involved, especially in the "scheduling" category. How do you determine the degree which a department is behind schedule?***

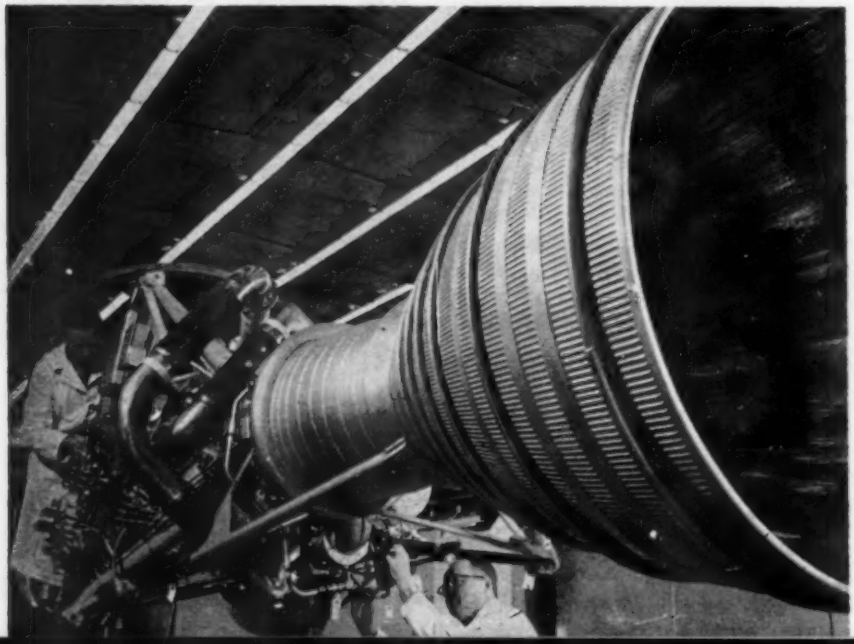
A. Simple. It makes no difference whether an operation is barely started, or nearly finished; if it is behind schedule, it is behind the entire amount of the standard set. All other categories are controlled in a like manner because each factor ultimately goes back to the basic scheduling requirements.

Q. ***Let's get into the actual production work. What is the role here for standard and special machine tools?***

A. First, you must consider that rocket engine requirements do not approach what is ordinarily thought of as long production runs. With ever-changing designs, we need great flexibility in our equipment. We make great use of standard machine tools which can be adapted to a variety of work through the use of special fixtures.

When special-purpose machines are required, the design criteria is to provide the maximum flexibility for quick changes, and to reduce obsolescence due to the changing nature of our products. If neither standard nor special machines are available, we design our own tools.

Mechanics make the final adjustments on an engine which will be used in the U. S. Army Jupiter intermediate range ballistic missile. The Jupiter IRBM will be deployed in operational use by units of the Strategic Air Command. It was an engine of the type shown which was called upon to furnish the powerful first-stage boost of the Army's space probe.



About Rocketdyne

Since 1946, Rocketdyne has pioneered in high-thrust rocket engines and advanced forms of propulsion for use in space.

Missiles and research vehicles powered by its engines have written history:

- √ The high-thrust Army REDSTONE, medium-range missile, first launched in 1953.
- √ America's first intermediate-range ballistic missiles—the Air Force THOR and the Army JUPITER.
- √ America's first intercontinental ballistic missile—the Air Force ATLAS.
- √ The nation's first steps into space—through the REDSTONE-boosted Explorer satellites in 1958.
- √ Advanced space probes by the Air Force and the Army.
- √ The Discoverer series of polar satellites.

Rocketdyne is delivering to the Army Ballistic Agency the H-1 rocket engine, a liquid propellant single unit that will be used in groups of eight to produce 1,500,000 pounds of booster thrust for the giant Saturn space vehicle. Under development also for the National Space and Aeronautics Administration is a single-chamber liquid propellant engine developing the same thrust.

Solid propellant rocket motors with more than 100,000 pounds of thrust have been developed for use as power packages in high speed test sled runs and for zero launch of fully-loaded operational fighter aircraft.

Practical steps are being taken in the development of ion and nuclear rocket engines for interplanetary travel.

MAIN OFFICES AND PLANT:
6633 Canoga Avenue, Canoga Park, California

OTHER LOCATIONS:
Neosho Plant, Neosho, Missouri
(Production and testing of liquid propellant rocket engines).
Solid Propulsion Operations, McGregor, Texas
(Design, assembly and test of solid propellant rocket motors).
Propulsion Field Laboratory, Santa Susana Mountains, California
(Research, development and production test).

TOTAL EMPLOYEES: 14,572

Main Plant and Supporting Facilities:	10,149
Neosho, Missouri	1,159
McGregor, Texas	575
Propulsion Field Laboratory	2,689
Total Engineers and Scientists	2,850

WEEKLY PAYROLL (Average 1958): $1,708,000

SUPPLIERS: 4,887 (Small business accounted for 66.6% of purchases during 1958)

1958 PURCHASES: $75,096,575.00

Q. ***What about the use of tape controls on machine tools?***

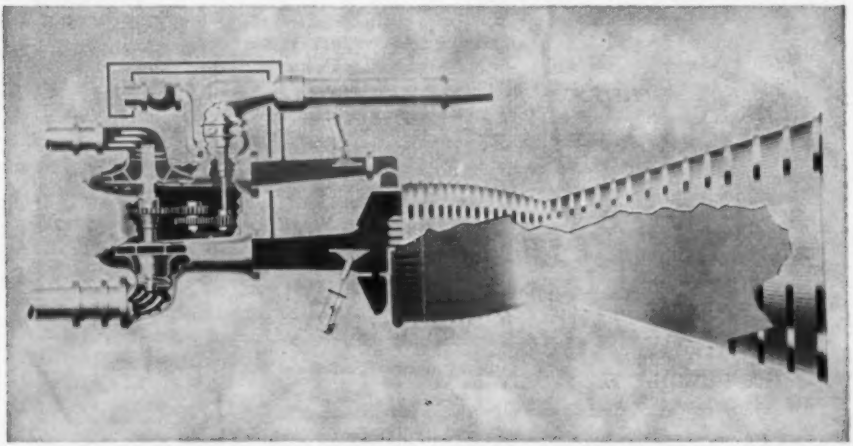
A. We are very enthusiastic about tape controls, and are using them to cut lead times and costs wherever possible.

Q. ***What is one of the most interesting tools designed at Rocketdyne?***

A. One of our best examples is concerned with a job which required the drilling of 5000 precision holes in 20,000 operations. If the drill operator made just one mistake, the whole part had to be scrapped. So to eliminate the possibility of such an expensive human error, we developed a device which simply dials in the pattern. All the operator has to do is put the part on a standard turntable; from there on the operation is automatic.

Q. ***What about some of the new metalworking processes? Cer-***

The large, liquid propellant rocket engines being designed and developed for use in the Atlas, Thor, Jupiter and Redstone missile programs consist primarily of a propellant feed system, control system, and thrust chamber. In the upper left corner of the accompanying artist's illustration of a typical large rocket engine can be seen the small spherical gas generator, the power source for the high-performance turbopump. The latter rotates twin pumps, forcing fuel and oxidizer through the injector into the combustion chamber. The thermal energy of expanded gases resulting from the combustion of propellants within the chamber is converted to direct kinetic energy as the gases are expelled through the nozzle to produce thrust.



tainly you are using some which are not yet in great use in other industries?

A. Probably the most advanced one we are using is "explosive forming." We use it to great advantage in deep drawing material from some of the tougher new metals. For instance, with Rene 41 we get up to four times the elongation possible with ordinary draw methods, and without spring back. We have also found this type of forming very economical for sizing operations.

Q. *We have heard several theories on why such draws are possible with explosive forming. Do you have one?*

A. The theory I like best is that the molecules in the metal move so fast they don't know what is happening. They simply don't have time to marshall their resistance against the lightning-like draw.

Q. *The cost control measures and production techniques we have discussed here should give the readers of "Blue Book" some new ideas to try in their own companies. But because they are also taxpayers, concerned with the wise expenditure of their tax money, would you say something about the possibility of a real breakthrough in costs in the space race?*

A. I can't speak for the entire missile field, but at Rocketdyne we have arrived at a big milestone in the rocket engine field. Cost-plus is a thing of the past; we can now deliver rocket engines on a fixed-price base.

• • •

Using explosive forming, ". . . we get up to four times the elongation possible with ordinary draw methods."

Short, powerful AR-2 liquid propellant rocket engines for use in fighter aircraft. The engines, used to augment conventional airplane's turbojet propulsion, increased Navy FJ-4F fighter plane's maximum speed and ceiling by significant amounts during test flights.

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Quality—now there's a word that's worn thinner than an office-seeker's shoe sole. But Ryerson Metalogics has given it new meaning, with a brand-new set of rigid quality-control standards that are completely detailed and published for your scrutiny. They govern every aspect of specifications, verification, packaging, cutting and certification of all Ryerson products. If you want a tangible example of the scope of this new quality program, take a good look at Ryerson cutting tolerances. Then see if you can find any that are held more closely.

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"Expert" is another worn-out word we hesitate to use. But we do put at your disposal the industry's most experienced men. They're ready to give you the benefit of their nationwide, daily experience with all kinds of problems—material selection, fabrication and the ever-present specter "cost of possession." And remember, nowhere else will you find as wide a range of published technical information to help you in your metalworking operations. It's yours for the asking.

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To machine the locking end of the turbine blade casting (lower left) wheels with a 15 degree slanted face (left), are formed with the diamond-studded "pine tree" forrming tool (lower center) to the profiled wheel (right). Two profiled wheels simultaneously grind the casting to give it the serrated form at lower right. Two diamond dressing tools which keep the wheels trued are at center.

FORM GRINDING JET BLADES

Serrations of pine tree forms are cut into grinding wheel with diamond forming tool. Grinding tolerances held to .0015; parallelism to .0005-in.

■ At Pratt & Whitney Aircraft Div. of United Aircraft Corp., producer of jet aircraft engines, shaping of abrasive wheels to complex forms has been simplified and accelerated by some unique applications of diamonds.

Hundreds of 4- to 10-inch blades make up the turbines for J-57 jet engines. These blades are locked into the turbine rotors by means of serrations on each side of the tapered base of the blades. The tapered base, with its parallel serrated sides, has been dubbed a "pine tree." Blades for second and third stage turbines are made from castings of a cobalt-base alloy specially developed for the stresses of jet propulsion. Forgings are used to make blades in the first stage turbine for the J-57 jet.

Mass production of a blade and machining of the "pine tree" lock to precise dimensions presented Pratt & Whitney engineers with one of the most exacting grinding

jobs they had ever encountered. Tolerance of plus or minus .0015-in. is allowed. The serrations must be held parallel to each other to within .0005-in. The tips of the "pine tree" serrations have a radius of .020-in.

Two grinding wheels impart the "pine tree" shape to the blade bases. The wheels are mounted in the same plane so that the piece can be passed between them with each wheel machining a face of the serrated end. The blades are first mounted in shuttles and anchored rigidly in place by surrounding them with molten Cerrobend which quickly solidifies. The shuttles containing the blades are placed in fixtures which pass the blade base between the formed grinding wheels. Two of the second stage turbine blades can be machined at the same time. With smaller blades, the fixture holds three shuttles.

A blank casting is passed between the grinding wheels seven times to remove .140-in. of stock from the locking base. The wheels revolve at 1100 r.p.m. and feed into the blade base at .010-in. increments, taking .070-in. of stock from each face, to bring the casting to the "pine tree" form. The seven-pass cycle takes about three

One of the Jones & Lamson machines with vertically mounted wheels grinds the "pine tree" serrations on jet engine turbine blades.

minutes. After each piece is cycled, two single-point radius diamond dressing tools automatically dress the wheels. The dresser is set to remove .001-in. from the wheel. A heavy flow of sulphur based oil coolant batches the wheels during machining and dressing.

Because of the complex requirements for forming the grinding wheel faces and setting them up to grind the parallel serrations on the blades, Pratt & Whitney decided to form its own abrasive wheels for the "pine tree" lock.

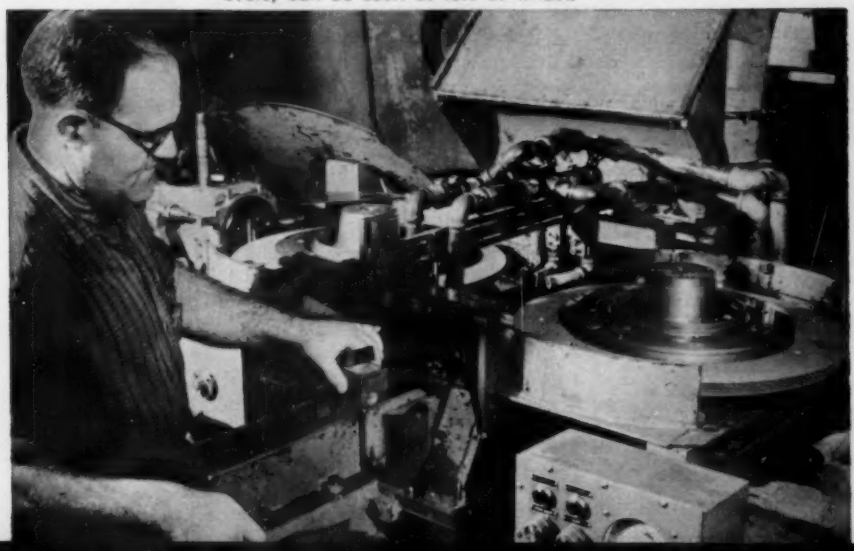
Twenty-inch and twenty-four-inch vitrified wheels with semi-friable abrasive are used in the Jones & Lamson and Ex-Cell-O machines which grind the blade locks. Wheels have a 15-degree angle on the face. The blank wheels are installed in the machines and a surface impregnated diamond-forming tool, with the same serrations required on the blade lock, is placed in the fixture that ordinarily holds the turbine blades.

Wheel specs are as follows: for the Ex-Cell-O machine, 24-in. wheel, FRA 701 J 8 V; for the J & L machine, 20-in. wheel, 3A 80 K 6 V 22.

The blank wheels are manually adjusted for parallelism and moved in to touch the diamond forming tool. The machine is started and a regular cycle begins with the wheels moving into the tool at .010-inch increments for a total of seven passes.

The diamond forming tool cuts the serrations in each wheel face. One seven-pass cycle of the machine usually brings the wheels to within .005-in. of finished tolerances. Then the permanently mounted single-point radius diamond-dressing tools, controlled by a serrated cam, are activated to finish the wheel forming. About ten passes of the diamond dressers, removing from .0010 to .0015-in. at each pass, are required to bring the wheel face to final form. • • •

On the Ex-Cell-O machines (guards removed for this photograph) the "pine tree" grinding wheels are mounted horizontally. An operator removes a finished piece, held in its shuttle by Cerrobend, from fixture. One of the diamond dressing tools, which automatically dresses the serrated wheel after each cycle, can be seen at left of wheel.



What often is a basic problem in many assembly operations—the need for a quality fastener that provides low in-place costs even when used on a job shop basis—is losing its significance at the Mine Safety Appliance Company plant in Pittsburgh, Pennsylvania. Production men here are relying on tubular and split rivets to stem the rise in assembly costs.

ADAPTING ASSEMBLY TO MULTIPLE PRODUCT LINES

■ It's one thing to mechanize or automate assembly operations in a plant producing one or two products on a mass production basis, and quite another to establish low-cost, semi-automatic methods for products made in small lots during relatively short production runs.

It is this latter situation that exists at the Pittsburgh, Pa., plant of Mine Safety Appliance Co. Despite the fact that MSA is the world's largest producer of specialized safety equipment, the very broadness of its line makes stocking of large quantities of many products and models impractical. It must assemble small lots of a wide product mix for inventory and special orders, and do so efficiently. In addition, any assembly equipment that is necessary must have broad application to a variety of products in order to justify the investment cost.

MSA has overcome many of these problems by widespread usage of tubular and semi-tubular rivets. These fasteners, which are equally adaptable in the assembly of metallic and non-metallic materials, can be set in equipment that often can be switched from job to job without any change of tooling. Equally important, while the work may be manually positioned, the fastener is fed and set automatically whenever the machine is cycled. This, plus low fastener price, results in low in-place cost. In addition, MSA has found that the fasteners often add to appearance, especially when plated;

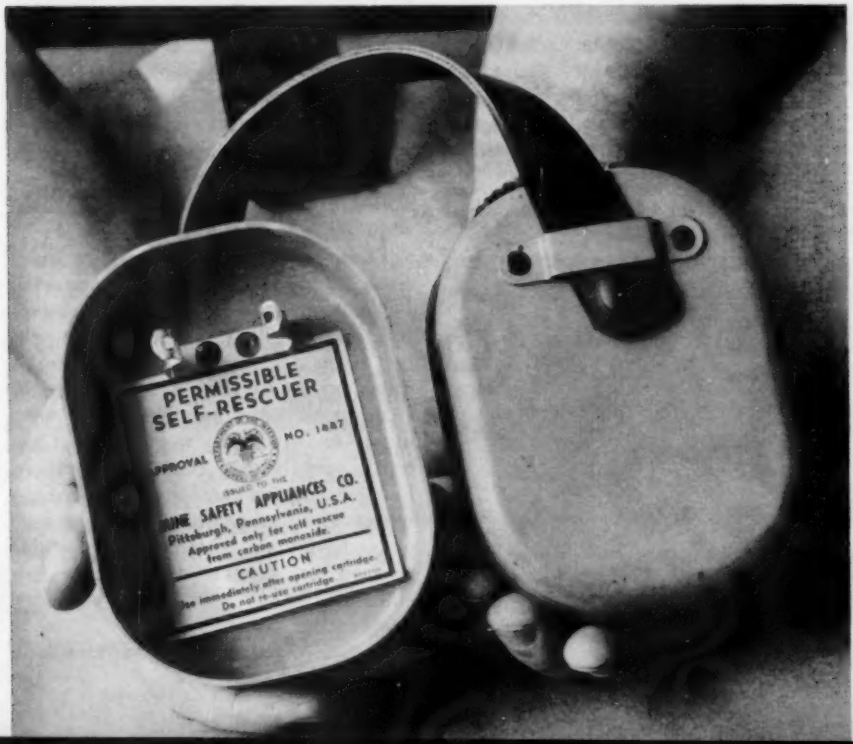
and, they have sufficient strength to withstand severe field requirements.

Evidence of this reasoning is seen in the manufacture of leather belts used by linemen, window washers and foresters. For obvious reasons, joint strength is a major concern, and appearance is also important. To insure both qualities, MSA uses only top grade leather, hand-cut and examined by experienced craftsmen. Tubular rivets are used to attach buckles, loops, and pads to the belt. Full tubulars —in most instances having a flat head —are star set and capped in single-spindle automatic setting machines. These are individual machines equipped with automatic feeds. Various anvils are stocked to set rivets of different lengths and also to set rivets of different diameters for other applications.

Normal practice is to install a riveting machine in a specific location, and transport the component parts of an assembly to it. Since belts are easily handled, there is no great advantage to installing the setting machine for in-line production. Parts are relatively small and can be stored in bins that are accessible to the operators.

The same procedures generally ap-

1—An internal clip and one end of a rubberized band are fastened to one half of a phenolic case by two semi-tubular rivets. As is so often the case at MSA, the assembly work is done on a job shop basis.



ply to fastening together the components for a self-rescuer kit. This is a respiratory apparatus enclosed in a phenolic case that fits into a metallic webbed holder. This holder consists of two formed sheet metal straps fastened together by six semi-tubular rivets, $0.112 \begin{matrix} + .003 \\ \hline - .002 \end{matrix}$ inches in diameter. Again, a single spindle machine is used; a job analysis showed that the operation does not warrant a multiple spindle machine and the fixturing to position the parts.

At an adjacent machine, a rubber strap is riveted to each half of the phenolic case. In this case, special attention is given to the height for the anvil. Compression must be sufficient to offset the resilience of the rubber, but not too extreme, else the phenolic may crack.

MSA is the first to admit that their riveting practices are, for the most part, considered standard in many plants. But they also point out that their production criteria are unusual, since many assemblies are made in relatively small volumes. A principal objective is to obtain maximum use of a setting machine without extensive retooling. Under their present arrangement, it is only necessary to change the anvils and adjust the height of the machine post in order to adopt the machine to a particular job requirement.

2—In a newly styled gas mask designed by MSA, semi-tubular rivets are used to attach buckles to the rubber face piece. These rivets are located in preformed recesses and are capped at the clinched end.

Selecting the right rivet for a particular design is not so easy, though. And it is at this point—during design—that engineers count nickels and dimes and evaluate quality. Whenever possible, a standard rivet is specified, for, like other companies, MSA recognizes the savings inherent in rivet standardization. They've occasionally had some difficulty in carrying out their program, however, because of the number of manufactured items and the different thickness and different materials involved. A standard rivet suitable in fastening a part to a safety helmet may not be long enough for other similar applications. Some helmets are much heavier than others, and to rivet a badge insignia to them requires extra long rivets.

Quite often, a functional use for a rivet warrants the cost of a special. Designs may be simplified or assembly time may be cut. Thus, some special rivets are purchased even though initial orders for the product are small.

Progress in standardizing is very much in evidence, regardless. Currently, prints and part numbers are being examined carefully to determine where standard rivets can replace specials. Inventory is already being decreased as some specials are eliminated.

There's evidence here and there that a trend toward more riveting is developing at MSA. A newly designed all service gas mask, introduced in August, is one example in point. Designed to improve a user's visibility, the mask has a single 0.100-in. thick glass, 8½ by 5¾ in. at its widest points, held in place by a metallic lens retaining spring clamp.

An equally noticeable improvement is the combined exhalation valve and speaking diaphragm. In previous models, these were separate parts and thus were more bulky.

Rivets also are used in the mask to fasten nickel plated clips that in turn fasten to the head straps. There are five to a mask, each .162 inches

.155

in diameter by .318 long and made of brass. Their installation is somewhat unusual since they fit into a molded rubber recess that, because of the end use of the mask, must be leakproof. This does not hinder setting operations; although the rivet head is in the recess, an operator can readily place it over an anvil, add the clip to the opposite side, and fasten it to the mask.

Some riveting operations are done on a hand press instead of in automatic setting machines. One example is the riveted tabs in the helmets used by jet pilots. These tabs snap to the pilot's oxygen mask. They must be installed to withstand tension and must follow the contour of the inside of the helmet. Two, .170-in. diameter, cadmium plated, steel, semitubular rivets in each tab do the job.

While such production requirements

3—Set in a hand press, the rivets used in the gas mask offer the necessary leakproof qualities. Again, because of volume, high speed is not essential to the setting operations. Instead, flexibility of equipment and assurance of consistent joint quality are the major requisites.

are quite different than those encountered in mass production shops, they are common in some small plants throughout the country, especially the job shops. The adaptability of riveting to this type of operation, as well as to fully mechanized assembly, accounts for its continued growth as a major assembly method. • • •

This article has been prepared under the auspices of the Tubular and Split Rivet Council. • • •

10

BLUE BOOK FEATURE

WHICH THREAD..... COARSE OR FINE?

by **William G. Waltermire**
Chief Product Engineer
Lamson & Sessions Co.
Cleveland, Ohio

■ As far as I can determine, using hand torque stop-read-and-start methods, Fine Threads produce connections about 10% stronger in nuts and tapped materials such as rolled steel, cast iron and harder materials. Further, they will stand higher ultimate torques providing added protection against torsional failure at a given assembly torque. They produce higher clamping loads to protect against fatigue failure and joint slippage. In the harder materials they are certainly easier to tap since the thread depth is less and the advance of the tap in one revolution is also less.

One is tempted to assume, therefore, that the fine thread would be generally preferred for bolting, particularly in the many cases where users torque to, or above, proof load in the search for better clamping force on the joint. In this case the desirability of the higher proof and ultimate strength of the fine thread is obvious. Still, many industries and companies decide in favor of the coarse thread, mainly because:

1. It assembles easier. An engineer of one large automotive producer says fine threaded nuts must be started by hand on bolts, while coarse threaded nuts can be inserted in the driver socket and driven automatically, resulting in a saving of time. Not every one agrees with this, but the fact is that a coarse threaded nut or screw does provide a better start with less chance of cross-threading.

What are the strength considerations regarding use of fine or coarse threads?

Which permits easier assembly?

When should fine or coarse threads be used?

What is the cost aspect?

Which will take a higher torque load?

2. Burrs are less liable to affect assembly and assembly torques. This is true, particularly, on unheat treated and/or large size fasteners, which are likely to be burred in mass-handling and transportation, Rotary gas heat treating furnaces are being rapidly supplanted by gas or electric furnaces in which the work is fed evenly through on flat aprons. As this replacement progresses the fear of damage to threads of heat treated bolts, coarse or fine, is not so great.
3. Coarse threads provide more room for plating or other additive finishes of a given thickness.
4. Coarse threads are less likely to seize and make for difficult removal in temperature applications, or joints where corrosion may form. Anyone who has had to remove muffler bolts from his automobile will quickly recognize the truth of this statement.
5. A large segment of industry is not concerned with developing high clamping loads, but have such large design safety factors, either by choice or by some code requirement, that bolts are only stressed to a portion of their potential strength.
6. At about the 1-in. size, fine thread nuts tend to strip earlier. This is because nut dilation may produce earlier disengagement of the shallower fine threads.
7. When tapped material is brittle and friable, it is impossible to tap a clean fine thread.

These very important reasons—not strength—mainly account for the greater popularity of coarse threads over fine threads. Unfortunately, the statement is often made that coarse threads drive faster because they assemble with fewer turns; this is difficult to support for the actual driving time of either thread in assembly is very short.

Similarly, it is often stated that coarse threads are less expensive to produce and this certainly warrants investigation. At a fastener seminar at the University of Wisconsin, one speaker said that the cost of producing each thread is about the same and with this I agree. In fact, I think the fastener industry must also agree since there is no price distinction on those standard parts which provide for either thread. Also, as stated earlier, it certainly is more expensive to tap a coarse threaded hole in hard material.

It has sometimes been said that the coarse thread is as strong as the fine thread, but, in my opinion, this re-

quires more investigation and explanation of the conditions of usage. Generally, I believe it is stronger in relatively soft materials such as aluminum, die castings and the like, and I recommend its usage in these cases on the basis of strength. For the mass of applications, though, I feel the fine thread is stronger in torque-tension, ultimate load and shear.

To investigate torque and tension, we cold headed a lot of C1038 bolts in the ½-in. size to the ½-20 blank size and reduced half of them to the ½-13 blank size. We then roll-threaded both series to produce about the same percentage of thread depth and heat treated them together to the same standard hardness, producing the following strength on direct tension tests with the bolts assembled in hardened adapters; Table 1.

It is interesting to note that the ratio of unit areas, fine to coarse, gives a theoretical 12.7% advantage on the ½-in. size. Perhaps the greater necking of SAE Grade 2 bolts is responsible for that grade developing less load advantage.

In practice a fastener is, of course, torqued to produce the desired pretensioning, or clamping *load*. In a tension application, failure of such a part in service will be in direct tension due to addition of external load. Obviously, the fine thread shows a superiority here.

Nuts are a different matter. Note the bolt stresses reported above when bolts were taken to ultimate destruction in direct tension in an adapter. The function of a nut is to stand the minimum rated strength of a bolt without failure. In other words, a nut should ordinarily develop the strength of a bolt without stripping the nut. Above this level, it does not matter much which series produces the highest nut stripping strength.

To investigate this, we cold forged ½-13 Heavy Hex nut blanks, reaming half of them to ½-20 minor diameter to produce an equal percentage of thread depth. Both series were then tapped to about the same fit on their respective GO (LO) thread plug gages. Nut hardness was R/B 93-91 for both series. We also annealed some nuts of each series to produce

TABLE 1

Grade	Hardness	1/2-13 Load	1/2-13 Stress	1/2-20 Load	1/2-20 Stress	% Load Advantage
SAE Grade 5	R/C 28-29	18,400 lb.	130,000 psi	21,000 lb.	131,500 psi	14.1
SAE Grade 2	R/B 94-95.5	13,340 lb.	94,200 psi	14,600 lb.	91,400 psi	9.5

TABLE 2

	1/2-13 Load	1/2-13 Stress	1/2-20 Load	1/2-20 Stress
As Forged	27,600 lb.	194,800 psi	26,700 lb.	167,200 psi
Annealed	17,100 lb.	119,600 psi	18,400 lb.	105,000 psi

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soft nuts of R/B 45-47 hardness to simulate low strength tapped hole materials. *Nuts were then tested in direct tension for strip loads on hardened mandrels,* with the following results; Table 2.

Note how the stripping strength of these relatively soft "as forged" nuts exceed the breaking loads of the harder bolts.

It is obvious that both thread series in the "as forged" condition develops nut stripping loads and stresses higher than the bolt breaking strength. Therefore, no advantage was listed above for either series. Based on load, the actual criterion of strength, the coarse thread had a 3.2% advantage, but this is actually technical, not a real advantage. We were surprised that

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the coarse thread did not show an advantage on stripping strength of the annealed nut.

We then torqued the "as forged" nuts on SAE Grade 2 and 5 bolts, taking them to destruction and reading the torques and tensions at every step; in actual usage bolts and nuts are not intentionally torqued to destruction. All bolts necked and broke, results as follows; Table 3.

The demonstration of the *strength superiority* of the fine thread bolt-and-nut assembly is to be expected. We often, though, overlook the fact that fine threads, under these conditions of assembly, will *take higher torque loads* before failing. Torque failure in assembly may occasionally occur because of wrenching conditions, lubricating platings or coatings, out of square assembly conditions which im-

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TABLE 3

Grade	1/2-13 Torque	1/2-13 Load	1/2-20 Torque	1/2-20 Load	% Torque Advantage	% Load Advantage
SAE Grade 5	130 ft. lbs.	15,450 lbs.	150 ft. lbs.	18,120 lbs.	14.5	17.2
SAE Grade 2	95 ft. lbs.	11,050 lbs.	100 ft. lbs.	12,600 lbs.	5.2	13.9

pose eccentric loads and variations in material strength and thread workmanship. Obviously, the fine thread bolt has a larger thread root diameter, so the fine thread has *higher torsional strength*.

Actually, since bolts and nuts are not designed to be torqued to failure, we are primarily interested in the loads developed at actual assembly torques. For a given assembly torque, the above tests showed; Table 4.

The lesson from the above can be reversed; that is, for a given clamping load, less torque is needed by the fine thread.

General Motors-Euclid Division, for one, recognizes the ability of a fine thread bolt to withstand higher torque loads. They, and most users, set assembly torques higher for fine threaded products than for coarse threads. They choose to assemble to a load equal to ¾ the Proof Load. Using their recommended torques, we found the above bolt and nut assemblies tested as follows; Table 5.

This, to my mind, is the best index of the strength superiority of fine threads over coarse threads so long as the nut is made of common steel or higher strength material. The higher assembly loads obtained also provide more elastic bolt strain, making for greater protection against fatigue failure.

This also raises the tantalizing question—cannot a designer, for a given design strength, reduce fastener size and costs by simply using a fine thread? This only applies to those applications where torque is or can be controlled in assembly.

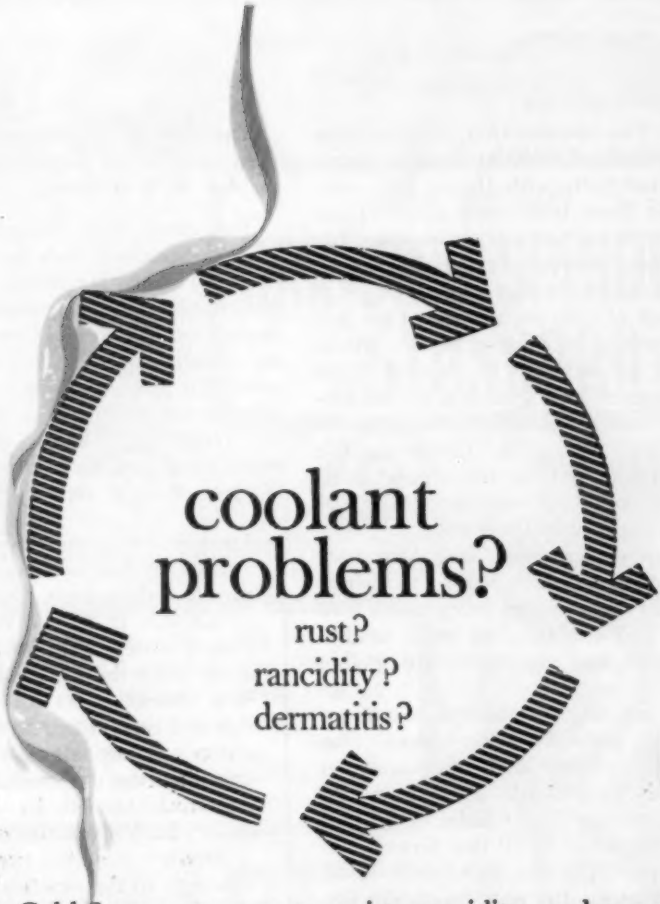
Why then, in view of strength advantages, are fine threads not in greater usage than coarse threads, particularly in high load applications where coarse threaded bolts are today being stressed to or above yield point *to get the highest clamping*

TABLE 4

Grade	1/2-13 Torque	1/2-13 Load	1/2-20 Torque	1/2-20 Load	% Load Advantage
SAE Grade 5	90 ft. lbs.	10,510 lbs.	90 ft. lbs.	11,200 lbs.	6.6
SAE Grade 2	60 ft. lbs.	7,060 lbs.	60 ft. lbs.	7,790 lbs.	10.2

TABLE 5

Grade	1/2-13 Torque	1/2-13 Stress	1/2-20 Torque	1/2-20 Stress	% Load Advantage
SAE Grade 5	75 ft. lbs.	8600 lbs.	90 ft. lbs.	11,200 lbs.	30.3
SAE Grade 2	50 ft. lbs.	5860 lbs.	55 ft. lbs.	7,150 lbs.	21.8



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The function of a nut is to stand the minimum rated strength of a bolt without failure

load? The construction industry uses SAE Grade 5 (ASTM A-325) coarse threaded bolts with Heavy Hex nuts, just as these tests were made. Their answer, I am sure, is easier assembly and less susceptibility to burrs and thread nicks. In this case I doubt if the lack of data such as that I am just now presenting, was a factor. Thinking of all industry in general, those to whom clamping load is a vital factor, I believe that the lack of sound test information is involved. We should note that the aircraft and automotive industries are large users of fine threads, very likely reflecting conclusions drawn from their own tests and observations. These industries generally have large laboratories and staffs and can conduct work smaller industries and companies are unable to do.

As previously reported, coarse threads proved better than fine threads in tests with the annealed nuts on SAE Grade 5 Bolts. At 90 ft.-lbs. torque ½-13 bolts developed 8950 lbs. while ½-20 fine thread nuts developed 7250 lbs. bolt loads. ½-13 bolts stripped the nuts at 12,950 lbs. with 165 ft.-lbs. of torque. ½-20 nuts stripped at 11,000 lbs. with 210 ft.-lbs. torque. As the length of thread engagement is increased, which is normal practice for non-ferrous material, a point will be reached at which the bolt will break instead of the tapped material stripping. To get a comparative evaluation of the coarse and fine threads, in these tests, we maintained one length of thread engagement for both thread series.

The cost of tapping soft material is less for coarse thread than for fine threads as it is faster.

The new B1.1 American Screw Thread Standard and the 1960 SAE Screw Thread Handbook are being published. The Government Interdepartmental Screw Thread Committee Handbook, H-28-1957 is being revised. All three of these have essentially the following to say on "USAGE OF THREAD SERIES," which really sums up the findings here reported. "*Coarse thread series.* This series,

Industry has been under pressure to reduce costs. One means to do this is to use only one thread series. With this, I go along with the qualification of, "one thread series for a given size and type of product." From a user's standpoint this permits simplification and reduction of the stock carried by him. It means, for a given *size and type of product*, that the user ought to weigh all the practical design considerations of all his applications. Then, for each size and product type, he should decide which thread, coarse or fine, is the best for all his applications, all things considered. This permits the same degree of savings through reduction of gages, taps and the number of fasteners, that would be obtained by using one thread for all sizes, all types of products.

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which extends up to 4 inch diameter, is generally utilized for the bulk production of bolts, screws, nuts and other general engineering applications. It is used in general applications for threading into lower tensile strength materials such as cast iron, mild steel and soft materials (bronze, brass, aluminum, magnesium and plastics) to obtain the optimum resistance to stripping of the internal thread. It is applicable for rapid assembly or disassembly, or if corrosion or slight damage is possible.

Fine thread series. This series, which extends up to 1½ inch diameter, is suitable for the production of bolts, screws, nuts and other applications where the coarse series is not applicable. External threads of this series have greater tensile stress area than comparable sizes of coarse series. The fine series is suitable when the resistance to stripping of both external and mating internal threads equals or exceeds the tensile load carrying capacity of the externally threaded member. It is also used where the length of engagement is short, where a smaller lead angle is desired, or where the wall thickness demands a fine pitch. It may also be used for

Expect a strength superiority of the fine thread bolt-and-nut assembly

threading into lower strength materials where maximum strength of the external thread is not required; otherwise the length of engagement must be selected to meet the above required strength conditions.

We have much yet to learn before we can make broad, flat statements on this subject. For one, with new torque-tension recording devices now being developed we can learn whether the conclusions here presented, will prove equally valid when nuts and bolts are power-driven, as they normally are. We need to investigate the Fin. Hex nut series more thoroughly. For these tests I chose Heavy Hex nuts because they are used by construction and other industries, and because, for a direct comparison of thread series alone, the extra dilation of Fin. Hex nuts should not be a factor. This must be checked out separately.

At the beginning of this article I listed advantages of Coarse Threads. I will conclude by listing those of Fine Threads. They are:

1. Stronger in hard nuts or tapped materials.
2. Develops more clamping load for a given torque.
3. More elastic strain at assembly torque, providing higher resistance to fatigue failure.
4. Requires less torque for a given clamping load. This may permit use of lighter, faster drivers.
5. Greater torsional strength.
6. Better adjustment, such as needed for cam follower screws and set screws. This adjustment is also a factor where cotter pins are

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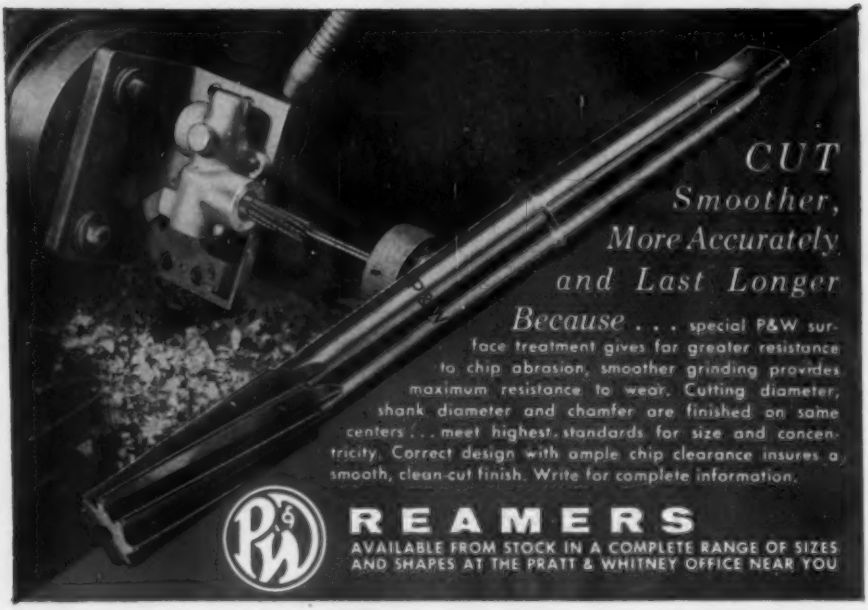
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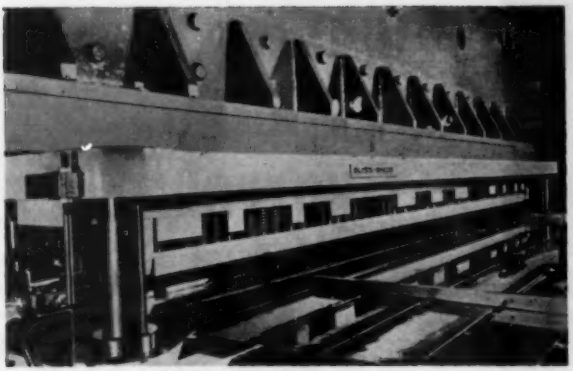
used with slotted nuts and drilled bolts.

7. Threads can be rolled closer to the screw or bolt head, since thread runout is a function of pitch. This is particularly important where washers are pre-assembled to bolts or screws.
8. May resist loosening better, due to the lower helix angle.
9. Better for short lengths of thread engagement.
10. Better for thin-walled materials as tapping torques are less.

I find that one of our experienced machine designers normally specifies fine threads; another, equally experienced, normally specifies coarse threads. The former accented the greater strength and adjustment advantages of the fine thread. The latter pointed out that assembly torques cannot be controlled through the life of a machine tool, and that, with hand tapping it is easier to produce an 80% coarse thread than a fine thread. It is the opinion of another Lamson & Sessions engineer that it hand taps as well. Our designers, like those throughout the country, are interested in actually weighing all considerations with the aim of using the best and most economical thread for the application. Yet here are a few of a group of engineers, working within a few feet of each other, all very experienced, with definite and conflicting opinions. As a move is now on to reduce thread series to one type, decisions should be made on facts, not on unsupported opinions. In this article it is not my intention to promote one thread or the other, but to contribute to factual discussion. • • •

Giant Die Set

Using a press brake for piercing and forming operations is made possible through use of this giant die set, one of the largest manufactured by the E. W. Bliss Co., New York City. The die set, 138" long, 28" wide and a total of 10½" thick, is now being used by Food Machinery and Chemical Corp., Riverside, Calif. In a press brake operation which pierces and forms channels from flat stock for conveyor side rails.



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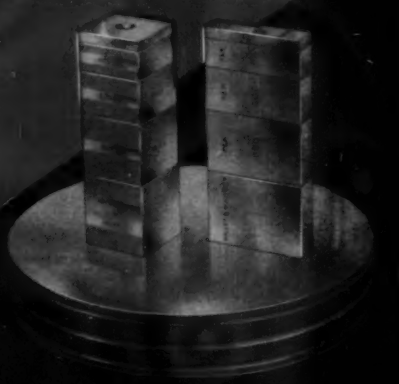

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BLUE BOOK FEATURE

THIS COMMITTEE GETS ACTION AT HOTPOINT

by **Darrell Ward,** Engineering Editor

■ Manufacturing manager Marshall Payne told us there is one way the small companies can compete with the big ones: greater efficiency and flexibility through better communications. "But, we can compete with them. Why? Because in the larger organizations manufacturing management, engineering and production become widely separated. They have communications problems. But, with our better communications and flexibility, we can make changes in a matter of hours and get the jump on them with actual production.

"The manufacturing manager must be close to his individual people to improve efficiency, lower costs, obtain better quality control, establish better morale, and to gain the necessary flexibility required for engineering changes and marketing requirements."

A daily meeting of all responsible people is called

Marsh Payne makes certain all information is in before making a decision as Nick Massello explains tooling problems on the changeover to 1960 line.

The following article results from a personal visit to the Hotpoint Refrigeration Div. plant where we attended a typical staff conference. We learned why Marsh Payne, Manufacturing Manager, feels that he can get what some managers consider a normal day's work done in an hour. There was no doubt that this type of conference did represent good communications and the efficiency of the operation was rather self-evident.

Small plants as well as large ones can benefit from better communications and coordination of effort. Marsh Payne claims that is one of the ways a small plant can compete with the large ones fully automated with very high volume production.

A study of the following article will point the way for more efficient communications in your own operation. Along with the story, you will find specific suggestions on how to do it.

promptly at 9:30 a.m. every morning. Each meeting lasts about an hour. The agenda is firmly controlled, but every question and problem is handled. All interrelated people concerned with a given problem are present for immediate discussion.

That is what we found at Hotpoint's Refrigeration Manufacturing Section. A daily meeting of 17 department heads with Marshall Payne! In a little over an hour's time, we heard reports and discussions on production schedules, procurement problems, storage and warehousing, materials flow and in process handling, quality control, shipping problems relating to sales requirements, assembly problems, engineering changes on a new model, finishing questions relating to durability and rust prevention, inventory on certain models, employee suggestions of a phenomenal record, plans for a company party, insurance, housekeeping, and problems with machines, equipment, tooling and maintenance. *Nothing was left without acknowledgment or decision.*

Marsh Payne called on every person present. Each question or problem

was discussed until an answer was found or a decision made. Nothing was strained, nor was there too much formality. Everyone enjoyed a bit of humor along with the serious discussions.

The meeting was informally opened with a round table discussion of late sports activities and some current bowling scores. Restrained humor seemed to punctuate the seriousness of the business at hand, relieved tension, and brought the people closer together as an efficient working team.

At the end, Marsh Payne explained to us what this Daily Manufacturing Section Meeting meant to him.

"After the meeting you just witnessed, I now have a picture of the whole day's operation. Approximately 50% of the discussion was on regular production problems, while the balance of the time gave me a chance to get across to the entire group some basic thoughts. And, I had a chance to pass along information on the division plans and activities from top management.

"In these meetings, I can accomplish in an hour what some managers take all day to do. Instead of being interrupted all day long, I am free for other more important matters. My sub-section managers have the same advantage. They can accumulate their problems during the day and not be bothered with frequent gatherings and discussions of first one thing and another. Yet, they all know that their problems can be raised, discussed, and decided on during tomorrow's meeting.

"This is what we mean by good communications throughout all the functional departments or sections of the plant."

How Is The Meeting Kept Under Good Control?

Marsh called on each person for a specific report. He followed with questions about the details. He heard out all that each manager had to say and invited discussion. He followed promptly toward some definite conclusion in each case, without hesitation or bickering.

Marsh Payne has a chance to get across to his men information and ideas from top management through these meetings. Left to right, far side: Herb Charsan, Pete Pytlik, Marsh Payne, and Nick Massello. Left to right, backs to camera: Charles Epperson and Harvey Maxwell.

"You notice," he said, "that we made a firm decision on every issue raised. The men know that I will come to some kind of decision without letting things drag. The decision may not always be the best, but we make it the best we can after full discussion. We never let it ride."

How Are These Meetings Different From Those In Other Companies?

"It is general practice in industry," Marsh explained, "to have regular foremen and management meetings of various kinds. But, ours is designed to pull the group closer together. When you have individual foremen's meetings, they get pretty personal. Many management meetings are just boring. At the lower levels, such meetings only serve to show that production is off, housekeeping is bad, or quality is poor. They are only an excuse to criticize people or air personal gripes.

"We try to make every meeting pleasant and constructive. We want to head off trouble before it occurs. We make definite plans for the day. Everyone knows what is planned. We all can anticipate and discuss problems before they become too serious. With the whole group brought in on each question, individuals feel they are sharing the load, not carrying all of it themselves.

"More important than this, however, is that we have total representation of every functional operation. There are people present to answer every phase of any question. With specialized group meetings, you will find problems which relate to other departments. You try to reach other people. They are not available. You can have one conference, meeting or discussion after another all day long, and still carry over problems until tomorrow or next week. We have all the people with all the answers present in one consolidated meeting to cover all the questions of one day. In this way, we are so closely integrated that there is no reason for anything to get completely out of hand."

What Was Accomplished In The Meeting We Attended?

Marsh Payne gathered the men around the conference table promptly at 9:30 a.m., but gave them a few minutes to get warmed up with informal conversation of a sociable nature. Then, he began calling off names of individuals for specific reports in turn around the table. Each report was comprehensive, yet brief. Each

Dave Owen on left and Ron Riedl on right listen as Tom Stewart discusses problems of making up carload lot shipments for 1960 refrigerator units.

person was given a chance to air his views about the facts and figures reported. Other people involved in the same question made their contribution. Marsh summed up or made a decision as required before the next report was heard.

Herbert Charsan, Manager of Production Control, reported on the previous day's production and its problems, then contributed to a review of the current day's production plans. Various individuals added to this discussion before decisions were made, because all were involved for one reason or another.

Harvey Maxwell, Manager of Inspection and Quality Control, gave an analysis on quality and raised questions which different people helped to answer.

Charles Epperson, Manager of Materials, explained how he has been getting parts for the new line with difficulty, many being shipped in by air freight to keep up with schedules after engineering changes.

P. E. Westerling, Superintendent of Cabinet Production, related his problems to the steel strike, explaining that he was using warehouse stock, obtaining material from various brokers, and consequently ran into odd sizes of steel.

Harold Black, Superintendent of Refrigerator Unit Production, outlined his plans for balancing the production lines with the new 1960 model. Numerous details were ironed out on this because with limited quantities of parts and materials, plus the fact that the new model would start off slowly until all were familiar with it, there was to be a gradual rise in the production schedule. Starting with from 20 to 30 units per hour, the line would slowly accelerate to 106 units in the near future with the line balanced.

Karl DeMiller, Supervisor of Inventory Planning, was referred to as "The Scheduler." His report and problems related to the over-all labor load, schedule and balance between all departments which feed the final assembly.

Nick Massello, Manager of Manufacturing Engineering, gave his story on tooling problems for the 1960 line, changes required in tooling, and his

Left to right: Arnie Carlsen . . . "We know what management wants and can express our views." Dave Owen . . . "Opportunity to know my manager better and for him to know me better." Tom Stewart . . . "In this group problems don't seem so bad." Ron Riedl . . . "Helps me understand the manufacturing processes and problems better."

COMMITTEE GETS ACTION, continued

program for progressive changes without interruption of normal production. Redento DeAmicis, Supervisor of Process Engineering, participated in the details of this discussion.

Tom Stewart, General Traffic Manager, discussed shipments made and preparations for making up carload lots for future shipments, condition of current inventory, and general warehouse problems.

Ronald Riedl, Cost Specialist, made his presentation on the direct labor and overhead costs, tempering the group with a better understanding of their operating efficiency.

Steven Sayban, Director of Safety and Suggestions System, reported on safety progress and employee suggestions. A remarkable record was reported of 584 useful suggestions for the year compared with averages of much less than 200 from other plants.

It was during this discussion that David Owen, General Foreman of Unit Assembly kidded Arnie Carlsen, General Foreman of Synthetic Enamel Finishing, by telling the story of how an employee suggestion resulted in a unique solvent mixture. Various formulations had been tried. None were quite satisfactory. Finally, acting on the suggestion of one worker, a new formula was developed and proved satisfactory. When the worker was asked what was in the mix, he replied, "It is the nearest thing to a good dry Martini."

Other regular members of this group meeting include Pete Pytlik,

Redento DeAmicis, (left), says, "I keep abreast of everything through these meetings." Herman Koplin, (right), thinks meeting is like fact finding board for immediate and future problems.

Left to right: Harold Black . . . "This meeting alerts me to problems from other areas." Steve Sayban . . . "Pertinent information from all operations can be wrapped up in one ball of wax." P. E. Westerling . . . "Meetings bring everyone's problems together and we get them pretty well solved."

Harold Black, Steve Sayban, P. E. Westerling and Harvin Au enjoy a humorous moment during the conference.

General Foreman of Final Assembly Unit Production; Charles Vesely, Supervisor of Time Study and Methods; Robert Loose, General Foreman of Evaporator Fabrication; Herman Koplin, Superintendent of Plant Maintenance, and, Harvin Au, Manufacturing Specialist.

Unlike most committee meetings which scatter thoughts and efforts all over the plant, leave people in a greater state of confusion than when they began, or result in compromises for all concerned, the refrigeration manufacturing section meetings at Hotpoint daily bring current problems to a head for immediate action. Each problem in turn is discussed and a firm decision is made now—not tomorrow or next week. Communications is no problem here!

• • •

13 Rules for Good In-Plant Communications

1—Meet promptly at the appointed time every day.
2—Meet regularly regardless of who might be absent.
3—Have all key people attend every meeting possible.
4—Make every person responsible for a complete report.
5—Encourage all related voices on each question.
6—Steer clear of personal or localized problems.
7—Have people share, not compare, related problems.
8—Search for ways to improve, not ways to criticize.
9—Stick to one question until it is settled.
10—Move directly toward conclusions once all information is in—leave nothing hanging fire.
11—Make a firm decision and stick to it.
12—Cover all important matters in one meeting, avoid scatter-shot meetings of separate groups.
13—Set no time limit if meetings are held daily.

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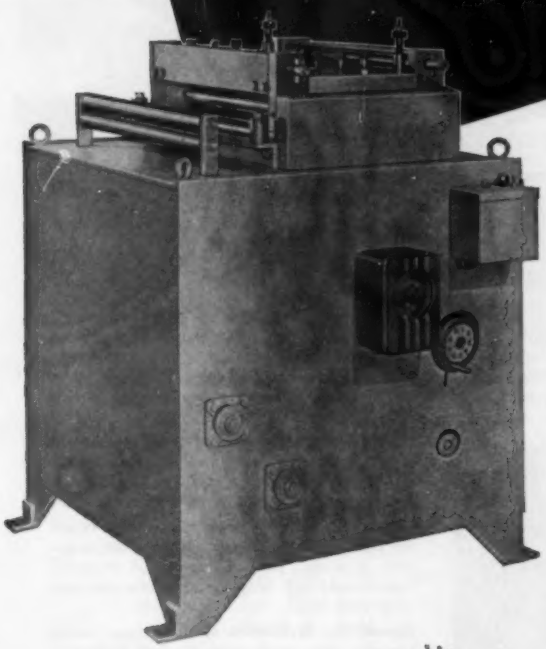

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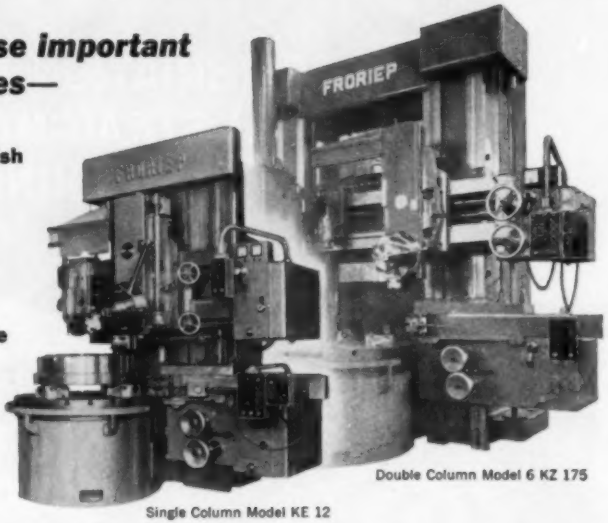

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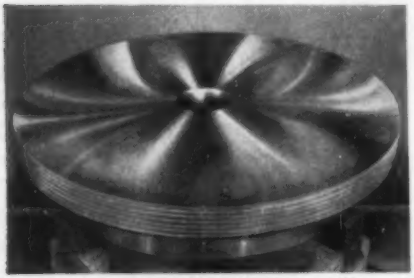

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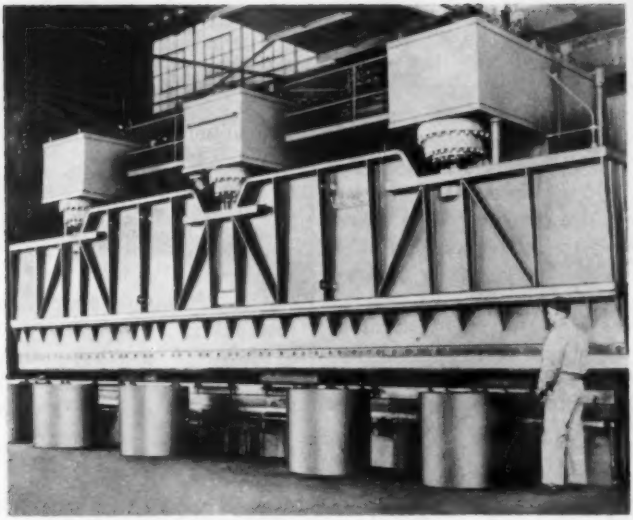
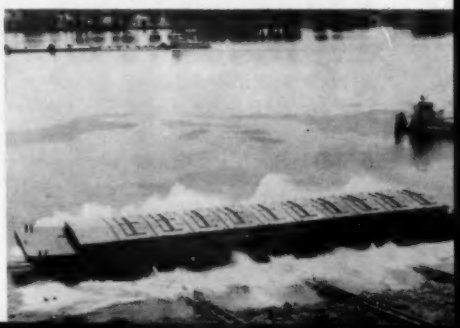


BARGE BUILDER UTILIZES VERSON HYDRAULIC GAP PRESS

■ A 600 ton capacity hydraulic gap press, manufactured by Verson Allsteel Press Co., Chicago and Dallas, is helping make an Indiana barge builder's work easier and less costly to perform.

Situated on the Ohio River at Jeffersonville, Ind., the Jeffersonville Boat and Machine Co. builds barges and towboats for river transportation. The Verson press is used primarily for flanging barge floor beams, bilge plates, headlog plates, and stern plates. The steel plate being worked ranges from 5/16″ to ⅝″, depending on the part; and flanging radii vary from ⅝″ for floor beams to 6″ for bilge plates. Lengths range up to 36 ft.



The press stands over 16 ft. above floor level and has a bed area measuring 30 in. by 438 in. Fast advance and return speeds

are 70 in. per minute with pressing speed 35 in. per minute.

Either manual or automatic press cycle control is available. Electric and hydraulic systems are arranged to permit operation at three different capacities. By utilizing only the center cylinder for power application, the press operates at 200 tons capacity. When 400 tons are desired, the center and right cylinders are used. For maximum 600 tons operating capacity, all three cylinders are used for power application. The desired condition may be chosen by use of a selector switch.

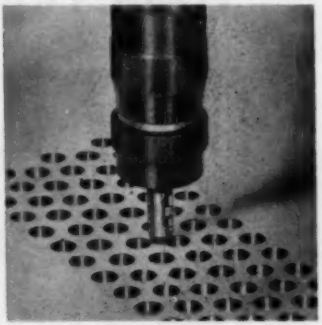
The press is protected by a safety device which cuts out applied hydraulic force if midloading beyond permissible deflection standards occurs.

• • •

Grooved Hole Machining For High Pressure Design

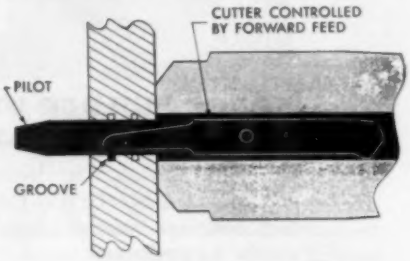
■ High heat exchanger pressures, already at 5,000 psi and expected to climb to 7,000 psi in the near future, have dictated new ways of joining heat exchanger tubing to flanges, housings and other solid structures. Latest technique is to employ grooved locating holes, into which may be swaged the heat exchanger tubes. Machining a multiplicity of grooved holes in heat exchanger tube sheets can easily require a high degree of special tooling and relatively low production rates.

One manufacturer, Ross Heat Exchanger Co. of Buffalo, has adopted a new tooling concept to solve this problem. Ross now employs a spring-loaded cutting tool, called the "BakSink," which produces a groove in a hole automatically. This tool is manufactured by Cogsdill Tool Products, Inc., of Oak Park, Mich. According to Ross tool engineers, this tool paid



for itself within four months after installation.

Many of the tube sheets manufactured by Ross contain from 2,000 to 3,000 holes. The BakSink tool is



mounted in a spindle of a programmed drilling machine which positions the tool, in front of the hole to be grooved-machined.

As the tool enters the hole during forward feed, the cutting blade of the BakSink remains inside a pilot arbor. When a ball bearing rotary collar on the tool seats against the work, further forward feed forces the cutter out of the pilot arbor. On the reverse stroke, the blade re-enters the BakSink arbor

so that it clears the work upon removal.

Grooving tool speeds used by Ross approximate reaming speeds for the same material and hole size. Blades are altered to vary the cutting clearance for different materials. Blades can be changed in a few minutes without special tools. Thus, the same basic tool can cut a number of different grooves; and, by exchanging the pilot, Ross can use the same basic tool to groove holes over a wide diameter range. • • •

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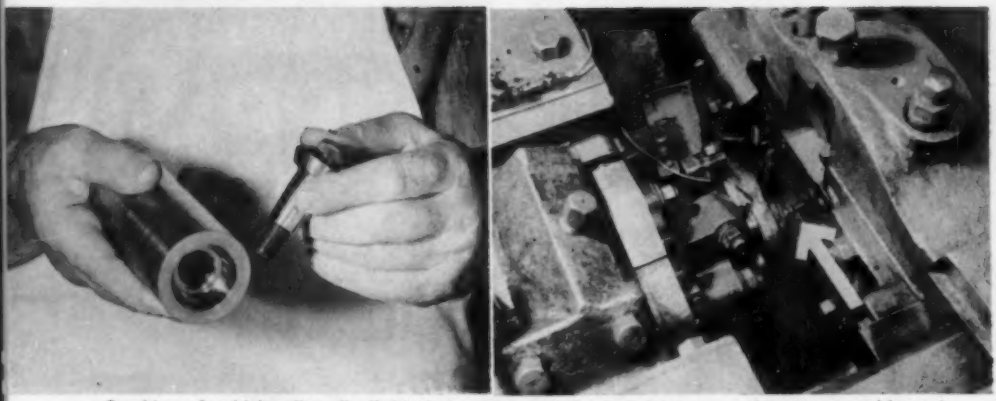

Cracking of cold heading die (left) that upsets stud for ball joint suspension was a problem at Lamson & Sessions Co.'s Cleveland plant. Two-step operation on this ¾ in. National cold header (right) produces studs for automotive ball joint suspensions. Type 8640 tool steel wire, fed from upper right, is cut into blanks, then upset in die made from Allegheny Ludlum's Ontario die steel. The machine was stopped to show the stud's position in the die.

ONTARIO DIE STEEL SOLVES DIE CRACKING

■ A switch in die steels has not merely "solved the problem" for one of the nation's largest fastener manufacturers —it has "made the job possible," according to Bill Harvey, tool superintendent at Lamson & Sessions Co.'s Cleveland plant. The "job" causing all the difficulty was the cold heading of studs for the ball joint suspensions of several leading American automobiles. Dies cracked under the 12,000 lb. interference fit necessary to upset-forge hard Type 8640 tool steel wire into studs. And deformation of the dies after heat treating was high. With rejects high, tool life short, and down-time excessive in replacing dies, production costs soared.

After studying the problem with tool steel engineers, Lamson & Sessions specified Allegheny Ludlum's Ontario die steel on a trial basis. Ontario, a high carbon-high chromium air hardening die steel used for many cold-heating operations, worked out so well that it is specified exclusively for forming ball joint suspension studs.

"Dies made from Ontario have increased production at least 15 times, and that's a very conservative estimate," said Mr. Harvey. "We've been able virtually to eliminate the cracking and warping that we experienced before."

Allegheny Ludlum supplies Lamson & Sessions with 2⅛ in. hot rolled Ontario bar stock, for production of the dies. (Lamson & Sessions makes its own dies for its approximately 8,000 different fasteners.) Lamson & Sessions cuts this stock into 4 in. long blanks, then drills a ½ in. hole into the blank.

A ball is then contour-bored on the die's end to a 1/1000 in. sphericity on an engine lathe. During and after this hand-machining operation, the ball of the die is visually checked for

size on a comparator. On this machine, an enlarged view of a lead casting of the die's spherical ball is superimposed over a blueprint or sketch of the stud to be formed.

Depending on the finding, the die is either further machined or sent on to be hardened and stress relieved at 1840 degrees F in a Limburg-type furnace. It is in this process that former dies deformed. Dies made from Ontario have proved so stable in size, Mr. Harvey pointed out, that it is no longer necessary to check them on the comparator for deformation after heat-treating.

The die is then sent to the tool finishing department where the shank is carbide-reamed and tapered to final dimensions—2 in. outside diameter, 4 in. long. It is now ready to be fitted into the die block of the two-step ¾ in. National Cold Header and begin knocking out studs for ball joint suspensions. • • •

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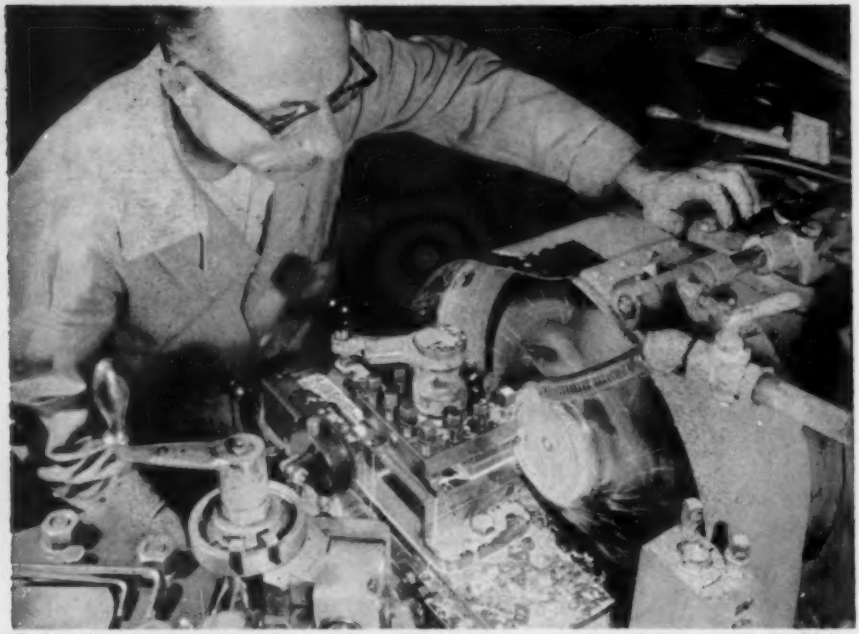

Turbine Housing Assembly for a missile auxiliary power unit receives close tolerance machining at The H & R Manufacturing Company, Euclid, Ohio. A tough, stainless steel precision casting with a high nickel and chrome content, this part requires accuracy of less than .001" on 4" diameters, surface finish as low as 32 RMS, and concentricity requirements of less than .002 T.I.R.A. total of 14 separate production turning operations is involved. This job is accomplished in four chuckings (two rough, two finishing), using carbide and high-speed steel tools on a Warner & Swasey No. 3 universal turret lathe. To assure accuracy, the workpiece is held in a special face plate adapter during finishing operations. • • •

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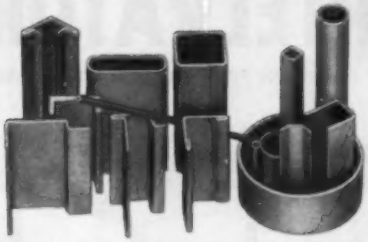

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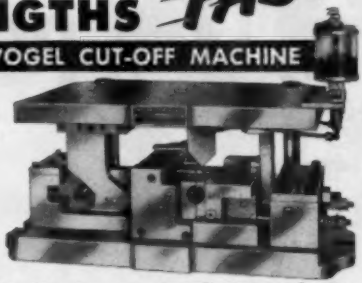

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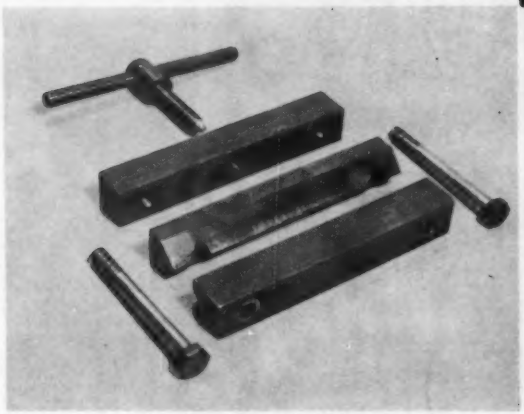


Parts of bending die ready to be assembled.

SHEETMETAL BENDING DIE

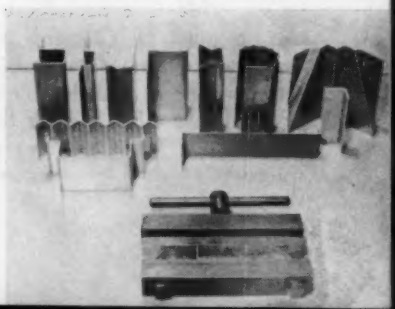
By **Robert Micals**

■ The sheetmetal shop where I am employed often changes the dimensions of the various small sheetmetal parts and for that reason dies are not made for forming. All bending is done with a brake and complex bends are impossible.

We fabricated a small hand operated "V" die which has saved us considerable time and effort and which enabled us to form bends such as the ones illustrated. It will bend 16 gauge stainless steel 2½" wide or 18 gauge mild steel 3½" wide into a perfect 90° angle.

The frame and the dies were made from ¾" oil hardening steel and tempered but cold rolled steel will give good service for all sheetmetal work except stainless steel. The screw which takes the brunt of the tool can either be machined from a good grade of steel or made by welding the handle to an Allen head cap screw. When all parts are assembled and the male die binds, tap with a plastic hammer until it moves freely. A little grease on the threads will prevent them from galling under pressure.

• • •



Any number of complex bends can be made with this bending die as shown.

TOOL HOLDER FOR STRADDLE FACING

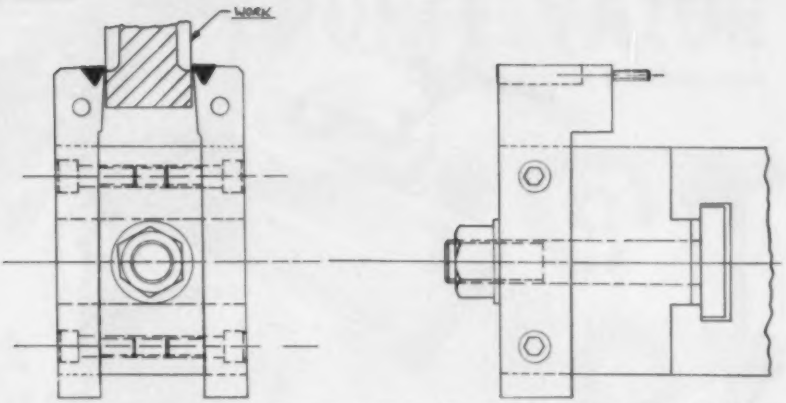
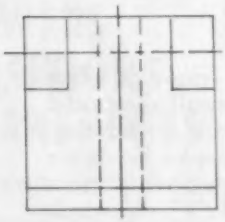


Diagram of the making of a rigid permanent type holder.



By **Roger Isetts**

■ When straddle facing high production parts such as gears, pulleys, rolls, or other similar work pieces in an engine lathe, dimensional accuracy as well as finish is often a must. Consequently, set-up time is usually a large factor in over-all production costs. This is especially true if the set-up must be changed periodically in order to run other parts. An operator can spend considerable time hunting for and adjusting his facing tools by trial and error to make acceptable pieces.

Illustrated is a rigid permanent type holder that while it is relatively simple to make will quickly pay for itself.

As is usually the case, inserted type solid carbide facing tools are used for such operations. A rectangular mild steel block is milled as shown to receive the shanks of these tools. A key is milled in the bottom of the block to fit the tee slot on the machine. A center hole is drilled through for a tee bolt that secures the block to the cross slide. Two holes are drilled and counterbored in the side of each tool shank and they are bolted to the holder with ordinary socket head cap screws.

Thus the whole assembly becomes a package. The dimensions, part and tool numbers can be stamped right on the block and it can be stored as is when not in use. • • •

Part Design Change Saves Manufacturing Costs

■ A suggested design change of a compressor valve mounting flange being contract-manufactured by Detroit Stamping Co. resulted in manufacturing process changes that brought

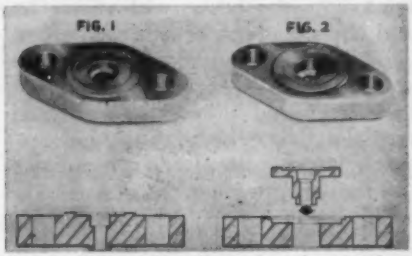


Fig. 1. Making shoulder and neck extensions an integral part of the flange body resulted in manufacturing process changes that allowed producing the completed flange in one progressive stamping operation. Fig. 2. Original design of compressor valve mounting flange used a screw-machined button that was press-fitted into the flange body to produce required shoulder and neck extensions.

welcome savings to the customer. The change originated with D. J. Damm, De-Sta-Co Plant Manager, who was reviewing all of the then current jobs

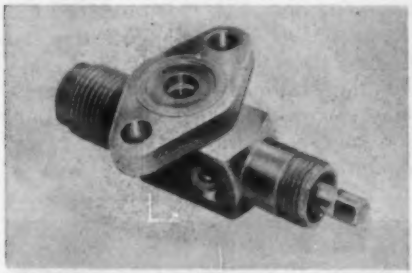
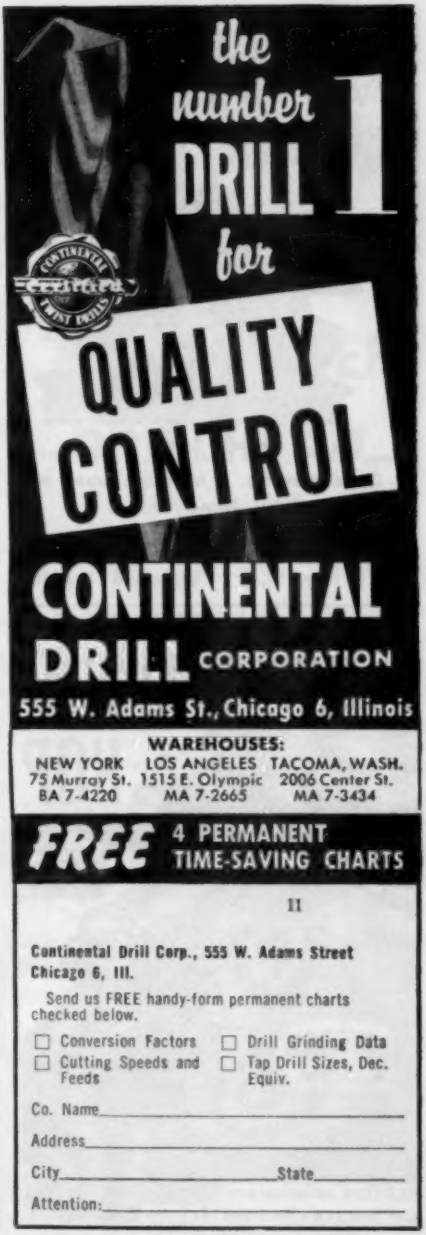


Fig. 3. Flange manufactured in one complete progressive stamping operation fits onto compressor valve to allow mounting and locking the valve into position.

in the division in an effort to cut manufacturing costs so that the resulting savings could be passed on to the customer. He determined that the part could be produced in a complete fabrication, thereby eliminating the need



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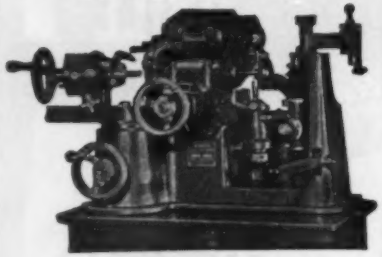

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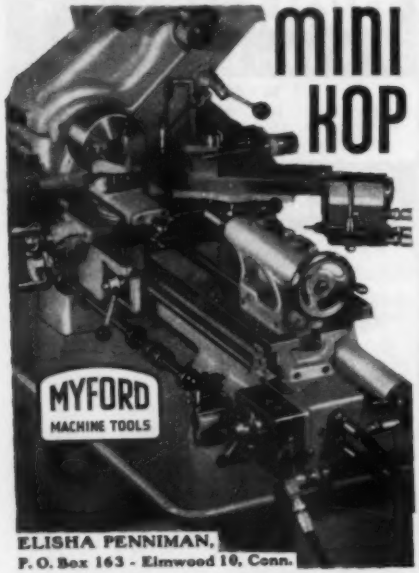

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for a purchased component and an extra assembly operation.

The flange's in-use and assembly requirements call for a shoulder extension on one side and a neck extension on the other, with diameters and bores concentric with each other. To fill these requirements, the part was originally designed with a separate machined button that was fitted into the flange body. The manufacturing process employed to produce the part stamped out the flange body with a separate screw-machining operation used to make the button. The button was then press-fitted into the body to produce the required shoulder and neck extensions.

The new design suggested by Damm made use of coining techniques developed by De-Sta-Co that allowed making the shoulder and neck extensions an integral part of the flange body. The job was then reprocessed into a single progressive stamping operation that produced the completed mounting flange within the original tolerance specifications, saving the customer the cost of a separate screw-machined shoulder button and an extra press-fitting operation. • • •

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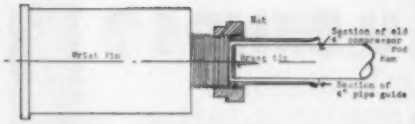

BUMPING OUT BALKY WRIST PINS

by **Paul C. Ziemke**

■ Old stationary engineers know what a chore it can be to ram out a set old wrist pin from a crosshead. The combination of heat and the varnish residues from lubricating oil sort of weld that pin in place.

The device illustrated has rammed many a stubborn wrist pin loose from its moorings as the wrist pin nut was screwed approximately one-half way onto the pin. Then the guide was threaded into the nut and followed by inserting the ram into the guide and centering it against the face of the wrist pin stud. Then a few sharp blows with a sledge will loosen the balky pin. The brass tip on the ram prevents defacing the pin end.

The section of old rod used as the ram will be most effective if held horizontal on a pair of wood horses, or slung from a rafter in a rope sling, to permit striking that square blow needed to start the old pin. • • •

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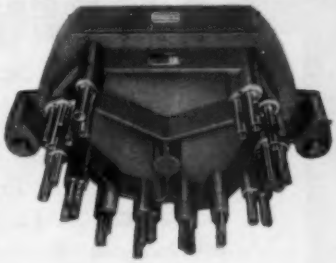

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free literature

14

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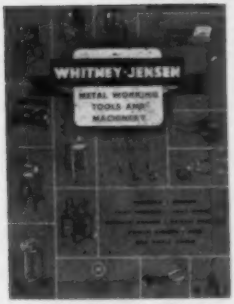

(See Number 1)

(See Number 2)

(See Number 3)

1. Metal Working Tools and Machinery. The new 1960 general catalog of the Whitney Metal Tool Co. covers the complete line of metal working tools and includes the new rod cutter series and the new universal bending brakes. Profusely illustrated, the catalog includes latest prices. Also available is the 1960 punch and die catalog showing styles, features, dimensions and prices of punches and dies manufactured by the firm. Whitney Metal Tool Co., Rockford, Ill.

2. Precision Thread and Form Grinding Machines. Sheffield Model Nos. 101 and 103 precision thread and form grinding machines with typical Crushtrue threading applications are described in 12-page Catalog No. TFG-11-59. Class 3 threads 8 to 40 pitch and precision worms are plunge-ground on the machines, which are also used for pass-over grinding of threads up to 80 pitch. Model No. 101 handles lengths to 12"; Model No. 103, up to 24". The Sheffield Corp., Dayton, Ohio.

3. Semi-Automatic Chucking Machine, the Kummer K 20, features electronic drives and controls, with infinitely variable speed motors, and a variety of chucking arrangements. The colorful brochure points out the machine's important design features, and includes a schematic power diagram, along with specifications. Provided with two individual heads and tool slides, the machine will under cam control, turn, bore, undercut, chamfer, contour and generate, automatically and with single point tools. Carl Hirschmann Co. Inc., Manhasset, L.I.

4. Drill Press. The Swedish Arboga factory has announced a new drill press, the EV-10. Brochure available reports a drilling capacity in steel of 3/8" with infinitely variable speeds from 1200 to 7200 rpm. The swing is 18" and the quill travel 3". Maximum distance from the spindle to table is reported as 12", with a table size of 10" x 17". Literature from Homestrand Machine Tool Corp., Greenwich, Conn.

5. Metal Spray Equipment. The Metco Type MB plasma flame spray gun applies coatings of any material which can be melted without decomposing. Despite melting temperatures from 10,000° to 15,000°F. sprayed work stays cool. Literature offered outlines how the process works, materials which can be sprayed, and applications. Metallizing Engineering Co., Inc., Westbury, L.I., N.Y.

FREE LITERATURE continued

6. Mounted Wheels. A shop foreman needing mounted wheels checks the manufacturer's catalog, picks one or more of six special shapes, indicates his size and specification, and sends his order. A new, simplified ordering system, "SS Series" (Special Shapes), gets its name from six special or basic shapes illustrated in a new bulletin from Chicago Wheel & Mfg. Co.

7. Metal Fasteners. A new 1960 catalog offered is referred to as one of the most complete references for threaded and headed fasteners. The list prices are up to date and reflect the most current changes. Atlas Screw & Specialty Co., Inc., N.Y.C.

8. Compressed Air Products. No. 158 completely color-coded product catalog presents representative filter, regulator, lubricator and drain pictured on the cover against colored squares. These squares, in turn, correspond with the colors on the inside tabbed pages. The correct unit in the correct size at the correct location is pinpointed. Wilkerson Corp., Englewood, Colo.

9. High-Speed Power Presses. Featured in Folder No. HS-1 is a Press Production Chart designed to help the customer quickly determine how Cleveland's high speed presses can increase his production and efficiency. Eleven different types are presented. The Cleveland Punch & Shear Works Co.

10. Chuck and Collet Actuators. The PowerGrip chuck actuator described in folder is a non-rotating air cylinder for operating air chucks, converting a lathe to bar and chucking work. The collet actuator Model 3A discussed is used to actuate drawback collets, step chucks, or any holding device requiring a pull-back action to operate it. PowerGrip, Inc., Rockfall, Conn.

11. Laboratory or Production Ovens. "V" Series ovens are specified, with prices, in flyer No. 203-4. Rotary shelves are provided. The ovens use forced convected horizontal air flow, gas, electric or steam. Despatch Oven Co., Minneapolis, Minn.

12. Cutting Tools. Typical tools, dies, gages and center-lock flat drill holders illustrated in folder are representative types of the firm's multi-purpose tools which perform several jobs in sequence on one machine with one set-up. B & W Precision Products Co., Detroit.

13. Vertical Four-Slide Machine. Bulletin V-81 details operating features and specifications for the new V-81 Verti-Slide machine. Machine components are fully described. Specifications cover machine capacity, drives, slide strokes, press, feed (90° and 180°) and applications. The Torrington Manufacturing Co., Torrington, Conn.

14. Cylinders. The Powrmation Series low pressure air and hydraulic cylinder line is described in flyer as offered in 1½" through 8" bores. Capacities are 250 psi air and 400 to 1,000 psi hydraulic, depending on bore size. Hanna Engineering Works, Chicago.

(See Number 7)

(See Number 8)

(See Number 9)

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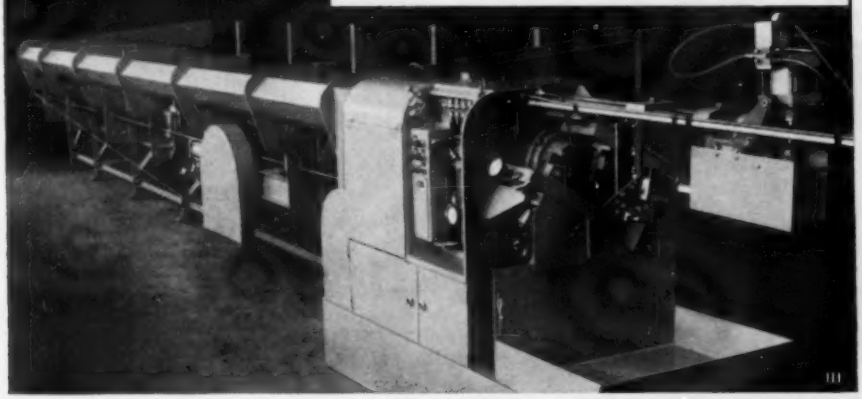

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15. Automatic Profiler. The MagneTrace, as described in literature, is an all-new tracer-controlled milling machine designed for self-feeding 360° profile milling operations under tracer control. It quickly and accurately produces any two-dimensional shapes. Seven spindle speed changes range from 375 to 5200 rpm. The machine is manufactured by The New England Machine and Tool Co. and sold by Pratt & Whitney Co., Inc., W. Hartford, Conn.

16. Seamless Mechanical Tubing. Folder TDC-193 discusses two general purpose steels which lend themselves very well to standardization: No. 4340, a through hardening steel, and No. 4620, a case hardening steel. Both are available in tube form in a complete range of sizes. The Babcock & Wilcox Co., Beaver Falls, Pa.

17. Thread Chasing Attachment. The Auto-Threader affords single point thread chasing for J & L turret lathes with a completely automatic cycle. Brochure further explains that threads are chased from the cross slide using the standard thread chasing attachment modified for power operation. Single point threading to a finish of 15-20 rms is completely automatic. Maximum threading length is 7" standard; 11" on No. 10 turret lathes; threads per inch, 2-64. Jones & Lamson Machine Co., Springfield, Vt.

18. Metal Sawing Machines. Bulletin No. 7000 covers the full line of Peerless power metal cutting saws, with limited specifications. These include the Handi-Cut 4"x4", Speedy-Cut 6"x6", Utility 4½" (wet or dry), band saw with automatic feed pressure control, Mechani-Cut, etc. Peerless Machine Co., Racine, Wis.

19. Press Brakes. Niagara's enlarged, modernized line of Series N press brakes, 90 through 1500 tons, is presented in 28-page Bulletin 89E. Description and illustration of design features, special work area provisions, typical forming and bending dies, tables for computing tonnages, specifications, and other pertinent information are included. Niagara Machine & Tool Works, Buffalo.

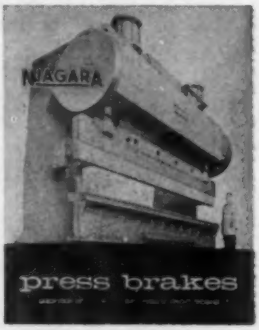
20. Tools & Units With Carbide Inserts, indexable and replaceable. Catalog provides a diagram, specifications and prices for the Posa-Cut holders. Prices are included for units and parts of the holders, as well as information on profiling tools, square insert tools, triangle insert tools, and negative rake precision ground inserts. Carbide Tool Co., Detroit, Mich.

21. Eccentric Gear Presses. A 12-page bulletin, in color, illustrates and describes the Warco line of two and four point eccentric gear presses in capacities from 100 to 1500 tons. The Federal Machine and Welder Co., Warren, Ohio.

22. Precision's Laugh Book. Steel drawers and desks, safety steps, filing cabinets and stock carts are among some of the company's products illustrated and described. Every other page includes cartoons and jokes of interest to business executives and others who make occasional speeches. Precision Equipment Co., Chicago.

(See Number 17)

(See Number 18)



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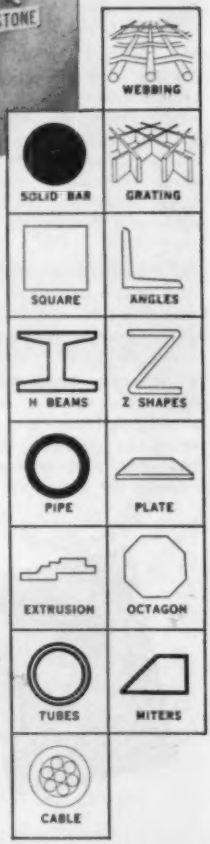

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FREE LITERATURE continued

23. Index Tables. Literature covers the Jackson fluid-power rotary index tables which feature a slow start and a slow stop on each index. The tables are used with machines for drilling, tapping, pressing, spot welding, assembling, spinning and other precision applications. They are offered with 10" or 18" dia. table top and choice of station requirements. Jackson Fluid Power Co., Detroit.

24. Drill Pointer. The Model 100 Winslo-Matic drill pointer produces helical, split-point or conventional points automatically, concentric within .0002, at speeds up to 1200 drills per hour. Brochure is available from the Winslow Product Engineering Corp., Arcadia, Calif.

25. Jig and Fixture Component Mfrs. A conversion chart, listing identical jig and fixture components manufactured by ten different companies, was prepared to aid purchasing men. It helps them bulk their orders for component parts, rather than purchase small quantities from ten different companies. Northwestern Tools, Inc., Dayton, Ohio.

26. Pot-Type Furnaces. 20-page Bulletin No. SEC-5 describes Sunbeam's complete line of fuel-fired or electric pot-type furnaces. Sunbeam Equipment Corp., Meadville, Pa.

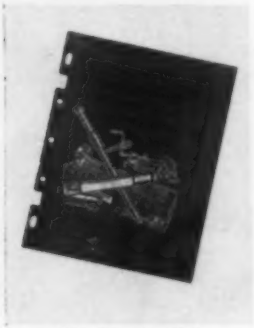
27. Machine Shop Accessories. Catalog No. 37A lists arbors, adapters, collets and other machine shop accessories which the company manufactures. The important features and characteristics are listed compactly for easy reference. The illustrated index helps the customer to quickly locate the product he is interested in. Brown & Sharpe Mfg. Co., Providence.

28. Gear Generators. The complete line of Farrel-Sykes gear generators is included in profusely illustrated Bulletin 400. Provided are complete specifications of all models, a description of design and construction features, application data and information on auxiliary equipment. Farrel-Birmingham Co., Inc., Rochester, N.Y.

29. Boring Machines, Grinding Machines, etc. The basic design features of all Heald machines and various models of Bore-Matics, internal grinders, rotary surface grinders, tool sharpeners, boringheads and wheelheads and attachments available are presented in General Catalog 1-2. Short descriptions of each model in the line are given, the model is illustrated and basic specifications are listed. The Heald Machine Co., Worcester, Mass.

30. Punch Presses, from 2 to 18 tons, including the Kenco Electro Safe punch presses, now offered in 5, 8, 12, 15 and 18 ton models, are outlined in four-page bulletin. Shown are deep throat, universal, slow-speed, vari-speed and special Mark III and VII series presses especially designed for multiple production operation. Kenco Manufacturing Co., Los Angeles, Calif.

31. Clamps. A brochure describing mechanical and air-operating clamps for holding masks and parts, and standard and special fixtures used to speed up production in color decoration of mass produced products, is offered by Conforming Matrix Corp., Toledo, Ohio.



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(See Number 28)

(See Number 29)

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32. Heavy-Duty, High Speed Engine Lathe is offered in three models with swings over the bed of 40½", 45½" and 49". The 75 hp Sidney 4025 offers swings over the compound ranges from 25½" to 36" for the three models. Features include a headstock with 36 speeds in true geometric progression and automatic calculation of cutting speeds through a single dial control; an over-all speed ratio of 160 to 1, and opposed-helix final drive gears. Folder is available from Sidney Machine Tool Co., Sidney, Ohio.

33. Automatic Drilling and Tapping Units. Technical data on the operation and selection of automatic drilling and tapping units, air or hydraulic powered, is contained in booklet available. Featured are the various uses to which these units can be adapted. Hypneumat, Inc., Milwaukee.

34. Retainers With Removable Punches. The "Cone-Lock" retainers, as described in catalog, feature punches which can be pushed by hand into the retainer and removed with a simple pulling wrench while still in the press. End and square retainers with regular punches from ¼" to 1" dias. are shown. New pull wrenches are also presented. Punch Div., Pivot Punch & Die Corp., N. Tonawanda, N.Y.

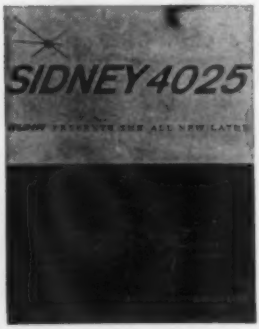
35. Comparison Chart on Carbide Burs. The Solid Carbide Tool Institute has prepared this chart with all the members having the same tool catalogued under different numerical designations. The purchasing agent can easily pick up the desired tool and extract the code number from any one of the Association suppliers. Solid Carbide Tool Inst., Phila.

36. "Modern Lubrication," Bulletin NB-24, presents in case histories the usefulness of the Type M lubricator, Type A lubricator, LPK system, Type AP lubricator, Type HIB lubricator, window units, and other Bijur products. Bijur Lubricating Corp., Rochelle Park, N.J.

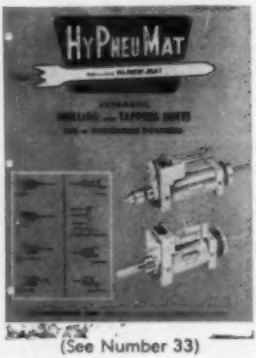
37. Measuring Instruments. A super comparator bench micrometer, reading in 50 millionths, an indicating micrometer and comparator, and an indicating micrometer with removable indicator in larger sizes, are illustrated and described in flyer offered by the Mahr Gage Co., Inc., N.Y.C.

38. Automatic Screwdriving System. The Tru-Tork system automatically drives almost any type of screw up to 2" long. It consists of a power screwdriver, hopper feed, and a plastic feed tube connecting the hopper to the screwdriver assembly. Literature is available from the Clyde Engineering & Manufacturing Corp., Madison Heights, Mich.

39. Tubing and Pipe, made of reported super corrosion resistant alloys, Hastelloy alloys B and C, is described in bulletin. Outlined are applications of these alloys, with tables showing their comparative resistance to various corrosive media. Size ranges and tolerances are included for the pipe and tubing. The Carpenter Steel Co., Alloy Tube Div., Union, N.J.



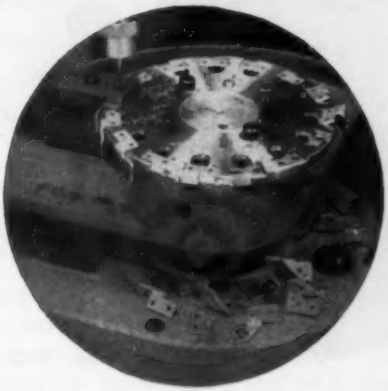
(See Number 32)



(See Number 33)

(See Number 34)

this plate paid for itself in 11 hours...



...and is still tapping 4400 holes per hour one year later!

The only tooling needed was the 15-position dial plate to hold the parts. The plate was bolted simply to a standard Snow Dial Index fixture on a standard Snow universal tapping machine.

We made the plate for our customer for $165.00. It arrived in his plant 6 days after he delivered a box of blank parts to us. With the plate went a tag showing Snow machine settings, and estimated hourly production based on the *test run already made* in our own shop. Time required for customer to set up the new dial plate was ten minutes!

Standard universal Snow machines for drilling, tapping, or threading are available in vertical, horizontal or angular models. Their modest price will amaze you. They reduce changeover time, and cut tooling costs to a ridiculous minimum. 28 different types of standard air-operated fixtures are available from stock. On your next job, let us show you what the Snow method can do. Submit samples and prints.

Snow Manufacturing Company, 435 Eastern Avenue, **Dept. B,** Bellwood, Illinois (suburb of Chicago).

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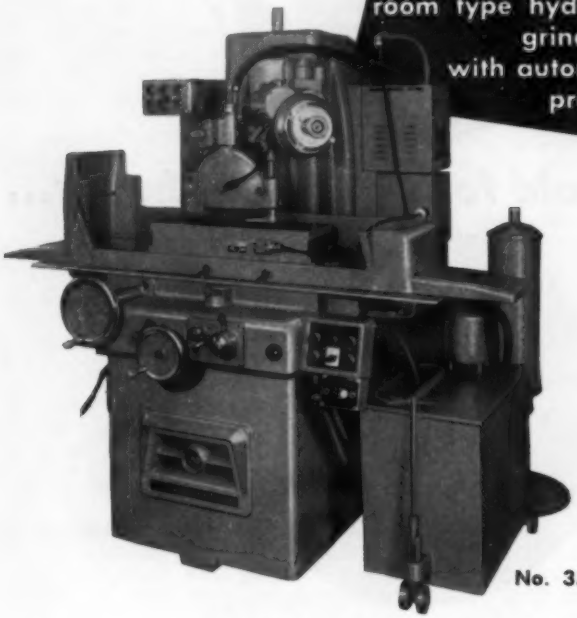

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Plus other features, too, such as: Rugged, one-piece column and base casting • Greased-for-life precision ball bearing spindle • Instantly variable hydraulic table speed • Variable speed hydraulic cross feed and continuous cross feed • Powered vertical movement of wheel head.

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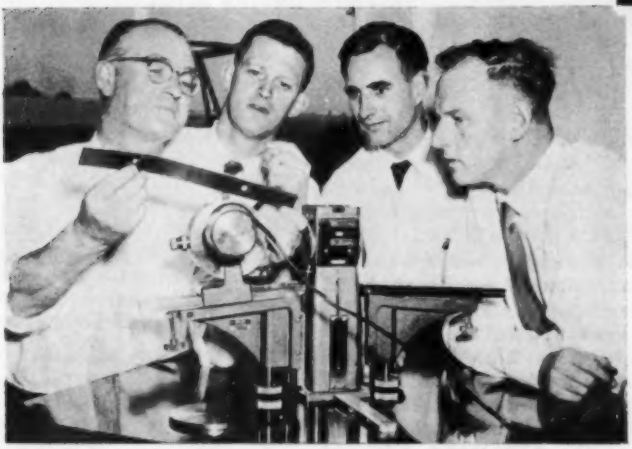

The four principal scientists who have successfully perfected a method of manufacturing synthetic diamond material examine an X-ray negative proving the authenticity of their achievement, at the Adamant Laboratory of De Beers Consolidated Mines in Johannesburg. The scientists are, left to right: Dr. J. F. H. Custers, director of research, Dr. B. W. Senior, Dr. P. T. Wedepohl and Dr. H. B. Dyer. The X-ray negative proves, by comparison with a similar X-ray negative of natural diamond, that the product is in fact diamond.

SYNTHESIS OF INDUSTRIAL DIAMONDS ACCOMPLISHED IN SOUTH AFRICA

The climax to a program, begun in 1955 in South Africa, was achieved by the discovery of a method of manufacturing synthetic industrial diamonds. The Adamant Research Laboratory was erected by the De Beers Consolidated Mines adjacent to the Diamond Research Laboratory in Johannesburg. This Diamond Research Laboratory has been conducting research on diamonds since 1947. **Dr. H. B. Dyer** and **Dr. P. T. Wedepohl**, physicists on the Diamond Research Laboratory staff, and **Dr. B. W. Senior** of England, were selected for the new venture.

The diamonds developed consisted in effect of an abrasive grit usable in resinoid-bonded grinding wheels. The Adamant Laboratory has not accomplished the manufacture of other types of industrial diamonds, or gem diamonds.

E. T. S. Brown (left), managing director of Industrial Distributors (1946) Limited, is shown a small pile of synthetic diamond material by Dr. J. F. H. Custers, who headed the team of scientists at the Adamant Laboratories of De Beers.

Machine Tool Exposition—1960 To Be In Chicago, Sept. 6-16

Over 130 U.S. machine tool companies will display more than 1,000 of the very latest models of American-built machine tools at The Machine Tool Exposition-1960, to be held at the International Amphitheatre in Chicago, September 6 through 16, it was announced by the National Machine Tool Builders' Association of Washington, D.C. This will be the sixth exhibition of machine tools sponsored by the Association. Previous Expositions were held in 1927, 1929, 1935, 1947 and 1955.

The 1955 Exposition, which was held at the International Amphitheatre, had a total floor area of 428,000 sq. ft. This was insufficient to meet the demand for display space. An additional Exposition Hall has therefore been added. The total floor area of The Machine Tool Exposition-1960 will be approximately 12 acres—with over seven acres of actual exhibit space.

The firm of Clapp & Poliak, Inc., of New York City, which has again been retained to manage this Exposition, will also conduct another exhibit, concurrently, at the Navy Pier, known as the Production Engineering Show. This show will consist of mechanisms, instruments and equipment that will contribute to greater production efficiency, and will provide an opportunity for the display of equipment and accessories applicable to machine tools.

Registration at the Exposition will likewise admit visitors to the Production Engineering Show—and vice versa. Shuttle buses will run between the two exhibitions. There will also be bus service from Loop hotels to the Amphitheatre.

All machine tool exhibits at the Exposition will be on the main floor level. They will all be the very latest design of American-made machines. The display rooms—the lower North and South Halls, the Arena, the Exposition Hall and Donovan Hall—will in fact constitute continuous exhibit space, giving the effect of a giant machine shop with nothing to obstruct the view except the machines themselves. Practically all of the machines will be in operation.

The machines will range in size from that of a small desk to that of a two-story house, and in weight from a few hundred pounds to well over 100 tons.

The setting-up of over 1,000 machine tools of all conceivable types, ready for operation, is a gigantic job. In order that the Exposition may open on September 6, installation must begin on June 1, 14 weeks in advance. The first machines will be installed in Donovan Hall and Exposition Hall, since the Republican National Convention will be held in other portions of the Amphitheatre in July.

"Only by increased productivity," says Donald H. McIver, Vice President-Industrial Sales, Ex-Cell-O Corporation, Detroit, and Chairman of the Exposition Committee of the National Machine Tool Builders' Association, "can American industry counter rising trends in costs. Within the last five years, research, invention and product design in the machine tool industry have developed countless new ways of saving production dollars. In fact, the Exposition might well be labeled '1001 Ways to Cut Costs.' It will be one of the great significant industrial events of 1960."

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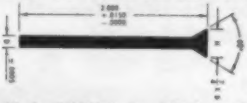

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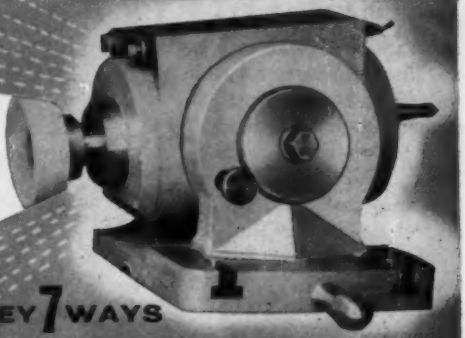

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POPE SUPER PRECISION, 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER CLEARANCE ANGLE SWIVELLING HEAD WITH ANGULAR ADJUSTMENT IN A VERTICAL PLANE

and get these seven savings:

1. Strong, long lasting tool cutting edges because cup wheel cutter grinding can be used for practically all clearance angles.
2. Tooth rest stays on the center line of the cutter for practically all grinding on centers or in the work head.
3. A single set-up grinds most cutters and reamers all over, using the swivelling table and Pope tilting head.
4. No more mistakes on clearance angles. They read directly in degrees from the scale provided on the head.
5. No more trouble or time wasted getting the right clearance angle on the tough ones such as slab mills, **taper reamers,** angular cutters and form tools.
6. No more heat checking of cutters. One safe speed — 3600 RPM — for all wheels generally used on cutter grinders.
7. Quick, easy adjustment saves you time and money every time you grind a tool.

Ask us to send you complete specifications including price and delivery.

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Sheffield Accuracy in Precision Measurement Affirmed By U.S. and European Standard Labs

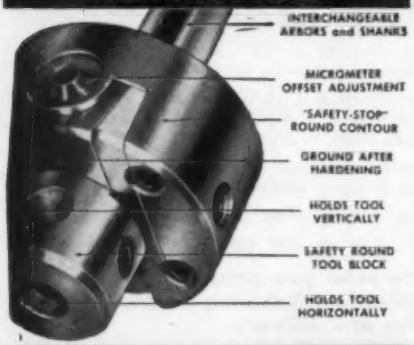
Agreement within one-millionth of an inch on the dimensional value of a 4" gage block, which had been sent to the national standards laboratories of the U.S., England, and Germany, as well as that of Sheffield's Eli Whitney Metrology Laboratory has been announced by Louis Polk, Sr., Sheffield president. Three of the laboratories measured the block within 1/10th of a millionth of an inch.

Sheffield president, Louis Polk, Sr., left, looks over the 4" gage block that was calibrated to within one millionth of an inch agreement. Col. W. J. Darmody (USA ret.) right, carried the block to the laboratories. Raymond Mahlmeister, center, is the director of the Eli Whitney Metrology Laboratory.

This historic agreement was obtained during an international laboratory calibration test. It portends that measurement to the seventh decimal place (.000,000,1) can be obtained on a commercial basis to set instruments and gages used to measure precisely fitting parts to within a millionth of an inch. This is increasingly important to the missile, aircraft, and atomic energy industries.

The survey was initiated by The Sheffield Corp. of Dayton, Ohio, manufacturer of dimensional inspection instruments and systems.

7 REASONS WHY FLYNN BORING HEADS ARE MOST USED



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Glide Control Corp. Obtains Nerco 2010 End Mill Rights

Acquisition by Glide Control Corp. of world distribution and sales rights to Nerco 2010 end mills and other machine tools has been jointly announced by **William B. Pollock**, president of Glide Control and **Franklin L. Naylor, Jr.**, president of Naylor Engineering and Research Corp. The end mills are available through the Industrial Division of the Glide Control Corp., Inglewood, Calif.

Nerco 2010, an alloy titanium developed by Naylor, is claimed to be markedly superior to anything now being produced in its application to

tools for machining of missile-age exotic materials.

Although the tool is not a tungsten carbide, it is similar to the carbide family. "Replacement cost on Nerco end mills are proportionately reduced," he continued. "In addition, they permit cutting speeds to be increased by 25% or more over carbide, are cooler running and may be used with standard coolants."

Tap Extractors Offered With Purchase of Tap Extensions

During the months of January and February all purchasers of a complete No. 9 set of the new Walton tap extensions, Style B, will receive absolutely free a standard set of six Walton tap extractors. This 33% bonus offer is described in a folder released by The Walton Co., Box 5, Elmwood Branch, Hartford 10, Conn.

This new set of tap extensions, packed in a metal case, contains nine 8" tools designed to hold standard taps in sizes from No. 0 to ½". With this complete set, taps can be quickly lengthened from 8" to 28", for either hand or machine tapping operations.

The purchaser has a choice of three different sets of tap extractors as the bonus.

Giddings & Lewis Announce New Trademark for Products

Integrated identification by means of a single trademark for the product lines of its four divisions has been announced by Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. The new trademark illustrated here will be applied to all of the company's products, including those of the former Cincinnati Bickford Tool Co., Kaukauna Machine and Foundry Co., and Davis Boring Tool Division.

GIDDINGS & LEWIS

CVA LATHE CHUCKS

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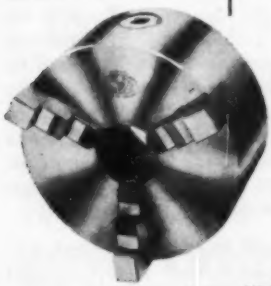

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Size	Weight	Dia. of Bore	Price*
3½"	6 lbs.	5/8"	$34.00
4½"	6 lbs.	1-1/8"	34.00
5½"	11 lbs.	1-1/2"	40.00
6½"	16 lbs.	1-11/16"	46.50
7½"	26 lbs.	2-1/4"	55.00
8"	38 lbs.	2-3/4"	70.00
10½"	68 lbs.	3-1/2"	86.00
12"	106 lbs.	3-7/8"	115.00

*Prices f.o.b. warehouse, N. Y. C.
Back plates available at extra cost.

Superior chucks produced by an English manufacturer famous for precision built machine tools, representing unbeatable values. Certificate supplied with every chuck attesting to and guaranteeing accuracy. All parts guaranteed for a year against defective workmanship and materials. Repair parts available.

We also stock 4 JAW INDEPENDENT LATHE CHUCKS

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Society of Carbide Engineers Holds National Meeting

On Saturday, November 21, the Society of Carbide Engineers held their annual meeting at the Belmont Plaza Hotel in New York City. A slate of National Officers and Executive Board Members were elected to take office as of January 1, 1960. They are as follows from left to right: Secretary Carl Erickson, Hartford Chapter; Vice President George Murphy, Hartford Chapter; Jess W. Powell, Providence Chapter, Executive Committee; William Carr, Providence Chapter, Executive Committee; President Bradford Smith, Worcester Chapter; William Hess, NY-NJ Chapter, Executive Committee; Treasurer William Collins, So. Conn. Chapter, and Francis O'Sullivan, Hartford Chapter, Past President-Executive Committee. The other member of the Executive Committee, Charles Andersen, Boston Chapter, is not shown. Outgoing National President, Francis O'Sullivan, was presented with a handsome desk set suitably engraved.

Cincinnati ASM to Hold Meeting on Space Age Material, Apr. '60

"Materials—Key to Space Flight" will be the theme of a two-day national meeting to be conducted in Cincinnati, April 27 and 28, 1960 by the Cincinnati, Dayton, and Columbus Chapters of the American Society for Metals. The purpose of the meeting will be to present in an unclassified manner a broad review of the unique demands made on materials by space flight systems, discuss progress made to date in satisfying these demands, and point out the unsolved problems requiring intensive future efforts.

Speakers will be top technical experts from government and industrial organizations working in the field of space flight technology.

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Metallizing Engineering Press Conference, Dec. 3, 1959

A press conference for the Metallizing Engineering Co., Inc. of Westbury, L.I. was held on December 3, 1959. It provided adequate information for those attending on the usefulness of metal spray equipment.

H. S. Ingham, vice president of engineering, explained the four methods of flame spraying used: wire metallizing, powder spraying (spraying metal oxide), ceramic (flame spray used where material that is sprayed has a high melting point), and plasma flame spraying (also for high melting point materials).

After the detailed explanation a demonstration was given of each process. The conference was concluded with a question and answer period.

Lincoln Electric Co. Opens New District Office

A new district office has been established by The Lincoln Electric Co. in Washington, D.C. **William P. Douglas,** field welding engineer for the Cleveland company, has been named the district manager. He has represented them in both Buffalo and Pittsburgh prior to this appointment.

Lang Gisholt Machine Co. Ltd. Formed in Scotland

John Lang & Sons Ltd., machine tool makers of Johnstone, Renfrewshire, Scotland, and the Gisholt Machine Co. of Madison, Wis., announce the formation of a joint manufacturing company to be called Lang Gisholt Machine Co. Ltd. This company will occupy the existing Lang factory at Johnstone near Glasgow. Directors of the joint company will be: **George H. Johnson,** chairman (president of Gisholt Machine Co.); **J. T. Lang, M.C., M.A.,** managing director; **Lt. Commander J.H.M.G. Lang, R.N. (retd.); J. S. Lang, M.A.; H. S. Johnson II,** and **Carl W. Hayden.**

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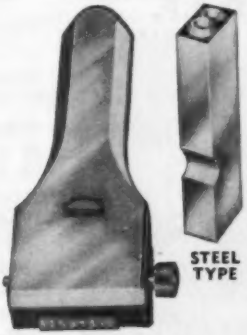

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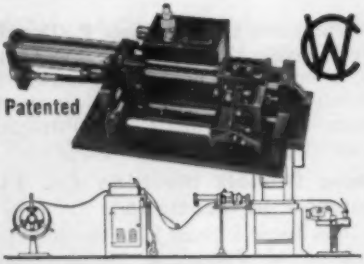

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manufacture the complete Lang range of lathes and power operated chucks for John Lang & Sons Ltd., who will continue to be represented at home and overseas by Associated British Machine Tool Makers Ltd. They will also continue the present Lang gear cutting for the trade. Manufacture of the Gisholt range of machine tools will be introduced on a steadily expanding basis for Gisholt (Great Britain) Ltd., whose sales representation in the United Kingdom is carried out by Burton Griffiths & Co. Ltd. and Gaston E. Marbaix Ltd.

Engelhard Industries Organizes Industrial Diamond Division

Engelhard Industries, Inc. of Newark, N.J. has announced the establishment of an Industrial Diamond Division which will import, stock, process and sell industrial diamonds in the United States, and provide technical service, application engineering and basic research to industrial diamond users.

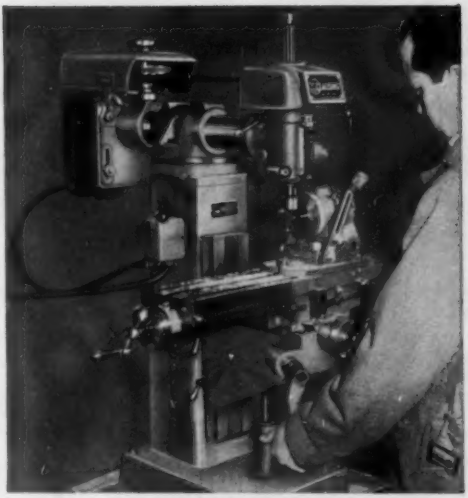
The announcement was made by **Charles W. Engelhard**, chairman of Engelhard Industries, Inc., and a group of Engelhard executives who are active in various phases of the Industrial Diamond Division. Engelhard noted that as soon as the needs of the market can be ascertained, the new Division will supply specific sizes of diamond grit. It will supply both regular natural grit and the selected and treated types of natural diamond which have proved superior in certain industrial applications.

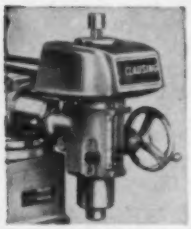
Engelhard also stated that an intensive research program had already been launched to study the more efficient use of industrial diamonds in present applications, and to develop new applications in which diamonds are more effective and more economical than alternative materials. Among the newer applications which are being investigated is the wider use of industrial diamonds in the glass industry.

HERE'S PROOF OF PERFORMANCE . . .

"The Clausing Vertical Miller is the best machine for the money on the market today! It is most versatile . . . and extremely accurate".

— F. L. BALLENTINE, EMPIRE TOOL ENGINEERING COMPANY, INC.





The high precision spindle and drive have 7 ball bearings . . . hardened spindle. Ground and hard chrome plated quill has full length bearing in head.

The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to machine at all angles with one set-up.

This report is typical of the experience of users everywhere. The CLAUSING VERTICAL MILLER is a precision machine tool designed for operations where "extremely accurate" machining is required. And, it is an outstanding producer, "most versatile, easiest to set up, get around and operate of *any* miller at or near its low price." Only $875 f.o.b. factory.

VERIFIED ACCURACY— Before it leaves the factory each CLAUSING Mill must pass rigid tolerance tests such as:

1. Top of table perpendicular to column ways within .0005" in 6" travel.
2. T-slots square with cross slide dovetails within .0005".
3. Table, parallel to turret within .001".
4. Spindle square with table, front to rear, within .001" T.I.R. in 5" circle.
5. Spindle taper (internal) run out within .0002" at spindle nose.
6. Table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.

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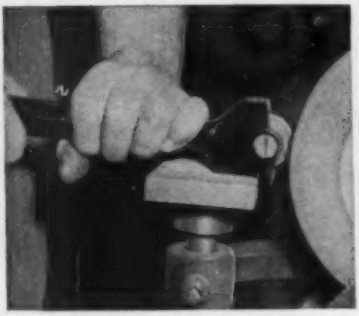


FOR $2.70

A typical Desmond Huntington grinding wheel dresser costs about $2.70 from your distributor, yet it substantially increases grinding production, makes wheels cut better, and lowers grinding costs. By dressing all your grinding wheels regularly you remove inefficient dull particles and loaded metal, expose a fresh new grinding surface. Your Desmond distributor can furnish the exact model you require. Ask his advice.

The only complete line of grinding wheel dressers and cutters

Desmond

The Desmond-Stephan Mfg. Co.
Urbana, Ohio

Use postpaid card. Circle No. 323

Merryweather-Strasmann Machinery Corp. Formed

The **Merryweather-Strasmann Machinery Corp.** was incorporated on October 2, 1959, as a successor to the **F. W. Strasmann Co.**, with principal offices at 600 South Bayshore Freeway, San Mateo, Calif. Major lines represented by the new organization include Barber Colman, Barnes Drill, Cyril J. Bath, Colonial Broach, Ekstrom Carlson, L & J Press, Hall Planetary, Matson Co., Motch & Merryweather Machinery Co., Optometric Corp. (Leitz). **George E. Merryweather** is president-treasurer of the corporation and **Fred W. Strasmann,** vice president and secretary.

Merryweather is also president of the Southwest Machine Tool Co. of Ariz. and N. Mex., first vice president of the American Machine Tool Distributors Assn., and a director of Motch & Merryweather, American Sip Corp., Southeast Machinery Co. in Fla. and Jack & Heintz in Cleveland. Strasmann was affiliated with various machine and tool companies in Germany before coming to the United States and starting business as a machine tool distributor in San Francisco.

Superior Hone Demonstrates Honing Machine in Bombay

More than a half million Indian businessmen and labor leaders are expected to witness the demonstration of a high production vertical honing machine by Superior Hone Corporation of Elkhart, Ind., during the month-long United States Small Industries Exhibit at Bombay scheduled to start February 1.

Rampe Expands Plant Space

A 100% plant expansion to keep pace with the growth of its line of precision tumbling machines has been started by Rampe Manufacturing Co. on its present factory site at 14915 Woodworth Ave., Cleveland. The enlarged facilities, doubling present factory space, will provide room for a three-fold production increase in the near future.

Nu-Matic Moves Manufacturing Facilities

Nu-Matic Grinders Inc. of Cleveland, Ohio announces it has moved its headquarters and manufacturing operation from its former address—8224 Carnegie Avenue—to larger quarters at 875 East 140th Street, Cleveland 10, Ohio.

Nu-Matic manufactures inflated and expanding abrasive finishing wheels and has just gone into the manufacture of portable belt sanders, inflatable drum sanders and floor mounted sanding machinery.

Dayton Rogers Announces New Subsidiary Plant

Dayton Rogers Corporation, Box 6, Route 7, Brookfield, Conn., is the new subsidiary plant of Dayton Rogers Manufacturing Co. of Minneapolis. The present superintendent is **Homer Cornell.**

While this plant is not manufacturing Dayton Rogers' complete line as yet, the primary activity is metal stampings in small lots, serving the Atlantic seaboard.

Van Norman's Crowder Forms Own Company

C. R. Crowder

C. R. Crowder, who resigned in 1958 as president of Van Norman Machine Co., Springfield, Mass., has formed his own organization, the C. R. Crowder Co. He will serve as a manufacturer's representative, with headquarters in Los Altos, Calif. The address is P.O. Box 447.

Crowder, with Van Norman for 30 years, will handle both automotive and industrial products. He plans to distribute nationally such replacement items as diamond dressers, tool bits and grinding wheels for automotive equipment.

Highly polished flutes produce smoother, more accurate holes!

It pays to specify

ACE

DRILLS
REAMERS
BLANKS

Premium Quality High Speed Steel, Carbide Tipped and Solid Carbide.

Call your local distributor today—or write Ace direct for latest catalog and price information.

ACE DRILL
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

Use postpaid card. Circle No. 324

Appointments and Promotions

Personnel Changes . . . Executive and Production

G. P. Burns

H. E. Blaine

W. W. Sorn

T. S. Gates

Rudolph Bannow, president of Bridgeport Machine Co., Bridgeport, Conn., recently was elected president of the National Association of Manufacturers . . . **George P. Burns,** with the firm 20 years, has been elected vice president and sales manager-machine tools for the Van Norman Machine Co. (a division of Van Norman Industries, Inc.), Springfield, Mass. . . . **John H. Greening,** formerly chief engineer, is now director of engineering for the Micromatic Hone Corp. of Detroit . . . **H. E. Blaine** has been appointed production control superintendent of Western Brass strip operations at the East Alton, Ill. plant of New York City's Olin Mathieson Chemical Corp.'s Metals Division. He replaces **James R. Higgins** who resigned . . . The Babcock & Wilcox Co., New York City, has announced the election of **Walther H. Feldmann** as a member of the firm's board of directors, filling a vacancy created by the death of **Vice Admiral Edward L. Cochrane, U.S. Navy (Retired).** A prominent industrialist, Feldman is president and a director of Worthington Corp. . . . **William W. Sorn,** with 15 years' background in manufacturing supervision, has been appointed manager of manufacturing at Lipe-Rollway Corp., Syracuse, N.Y. . . . Election of **Ben F. Bregi** as vice president of manufacturing and research, and **T. S. Gates** as vice president of engineering was announced by the board of directors of the National Broach & Machine Co., Detroit. Bregi succeeds **Max B. Mentley** who is retiring and being retained as a member of the board of directors and a consultant . . . The Cone Automatic Machine Co. Inc., Windsor, Vt., has announced the appointment of **Robert R. Rhodehamel** as general manager. Until recently he was vice president of The Patt Brothers Machinery Co., Willoughby, Ohio. He is an authority on multiple spindle automatic bar and chucking machines . . . The American Tool Works Co., Cincinnati, has announced its recent elections:

J. H. Greening

W. H. Feldmann

B. F. Bregi

R. R. Rhodehamel

Prevent Toolroom Bottlenecks and Increase Production

with Hammond of KALAMAZOO

CARBIDE TOOL and CHIP BREAKER GRINDERS

SCE-6 Oscillating Electrolytic Carbide Tool Grinder. The wheel oscillates.

CBW-6 Chip Breaker and Diamond Finishing Grinder. Electrolytic Chip Breaker Grinder also available.

14-WD Wet or Dry 14" Carbide Tool Grinder. 6" and 10" models also available.

SAVE TIME · TOOLS · WHEELS

America's most modern and complete line of Carbide Tool, Chip Breaker and Diamond Finishing Grinders. Over *10,000 in service.*

Ask for Carbide Grinder Catalog.

Hammond Machinery Builders INC.

1614 DOUGLAS AVE. · KALAMAZOO, MICH.

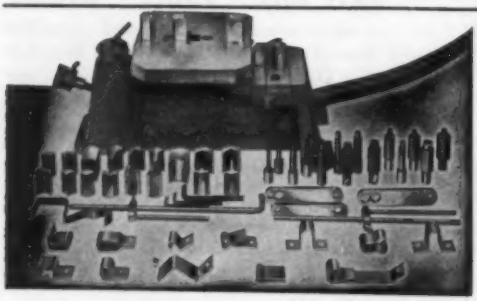
Use postpaid card. Circle No. 325

R. S. Alter

J. C. Hussey, Jr.

R. H. Dunteman

Robert S. Alter, with the firm since 1900 in executive capacities, was chosen to succeed **J. B. Doan** as chairman of the board of directors, as Doan retires; **Arthur C. Nolte,** with the firm since 1936, was elected to the board of directors, and **John C. Hussey, Jr.,** was named sales manager and was also elected to the board of directors. **Robert H. Dunteman** is the new advertising manager . . . The Rockford (Ill.) Machine Tool Co. announces the election of the following new executive officers: **Harry B. Newton,** chairman of the board; **Kenneth M. Allen,** president; **Robert C. Christenson,** vice president and secretary, and **Howard H. Swenson,** assistant secretary. . . . **Wesley F. Payne** has been appointed chief field engineer in the Tri-Matic Oscillating Abrasive Belt Grinder Division of Sales Service Mfg. Co., St. Paul, Minn., and will be responsible for new application service in the division . . . Appointments and promotions for the Rivett Lathe & Grinder, Inc., Boston, include **Thorwald S. Ross, Jr.,** to vice president in charge of manufacturing; **Walter C. Woodworth** to production and procurement manager, and **William R. Wright** to purchasing agent . . . The board of directors of The Carborundum Co., Niagara Falls, N.Y., has elected **John F. Claydon,** general manager of the Coated Abrasive Division, as vice president of the company. **Paul E. Hoffman** has been appointed Account Supervisor in the Advertising Branch of the firm, and will be responsible for advertising and sales promotion for Carborundum's Bonded Abrasives Div., Electro Minerals Div., Carborundum Metals Co. Div., and Canadian Carborundum Co., Ltd. The Carborundum Metals Co. has appointed the following to new positions: **Lyle B. Hoskins,** manager of manufacturing for both the Akron, N.Y., and Parkersburg, W. Va. plants. Reporting to Hoskins will be **George L. Chapman,** plant manager, Parkersburg plant; **Herman H. Brunotte,** plant manager, Akron plant; **Robert G. Warrick,** manager, Fabricated Products Dept., and **Denis A. Kitchen,** manager, Production Control Dept. **Elvin W. Smith** was appointed process engineer at the Parkersburg plant, reporting to Chapman, the plant manager.



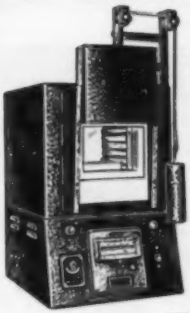
Multiform BENDER CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air and hydraulic models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend, and cut round or flat brass, bronze, aluminum, steel, etc., up to 1/8" x 1 1/2" as illustrated, other models up to 1/2" x 8".

J. A. RICHARDS CO.
KALAMAZOO, MICH.

Use postpaid card. Circle No. 327



Request literature on complete line of Huppert furnaces and ovens.

Be sure of Maximum Heat Treating Efficiency with

HUPPERT FURNACES

- Range: 300° F. to 2000° F.
- High temperature, heavy-duty Kanthal elements
- Multi-insulation
- Counter-weighted, tight-sealing door
- Operational pilot light
- Shipped ready to operate

Model No.	Inside Dimensions			KW	Prices 220 Volt Single Phase	
	Wide	High	Deep		With Huppert Input Controller	With Electronic Temp. Controller
869	8"	6"	9"	4	$296.00	$480.00
11*	8"	6"	12"	4	306.00	518.00
12*	8"	8"	12"	6	382.00	590.00
12A*	8"	8"	18"	9	490.00	698.00

*For 2300° F. add $95.00 to No. 11 and No. 12, and $105.00 to No. 12A. No. 12A can be furnished for 3 phase at no additional cost. For floor model add $52.00 to above prices. No. 869 standardly supplied for 2200° F.

K. H. HUPPERT CO.
Manufacturers of Electric Furnaces and Ovens
6845 Cottage Grove Ave., Chicago 37, Illinois

Use postpaid card. Circle No. 328

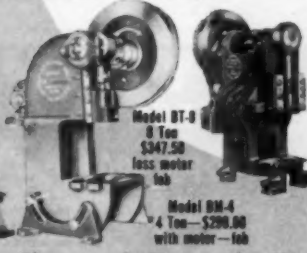
ALLEN HEAVY DUTY PUNCH PRESSES

Moderate in Price

Hundreds of different Model Combinations 1 to 12 ton Capacities

Powerful Dependable and Economical Fully Guaranteed

See your Supply Dealer or write for catalog giving complete information, specifications and prices on our line of Heavy Duty Punch Presses.



Thousands in use the World over

ALVA ALLEN INDUSTRIES, Dept. MTB, Clinton, Missouri - Tel. TUrner 5-3331

Use postpaid card. Circle No. 329

R. A. Young

F. F. Ward

G. F. Fox

Personnel Changes . . . Sales and Service

Ray A. Young, formerly sales representative for L. W. Hodson Machinery Co., Cleveland, has been appointed general sales manager of Seneca Falls Machine Co., Seneca Falls, N.Y. He has represented the Seneca Falls firm for many years . . . **Frederick F. Ward** has joined the Mech-Tron Division of Arrow Tool Co., Inc., Wethersfield, Conn., in the capacity of sales manager . . . **Gerald F. Fox,** a sales engineer since 1954 with Dana Corp. of Toledo, has been transferred to the West Coast area, where he will function for the company in a like capacity . . . The Morse Twist Drill & Machine Co. (a division of Van Norman Industries, Inc.), New Bedford, Mass. has named **Frank E. Olson** to cover sales activity for the firm in the Baltimore-Virginia area. He previously served in the Carolinas. **David L. Topp** of N. Olmstead, Ohio, and **Ralph A. Wilkins** of Detroit also have been appointed to the Morse company sales force . . . **Glenn R. Kraus,** previously sales engineer for the company, has been named assistant sales manager for The American Tool Works Co., Cincinnati . . .

New Dealers and Distributors

Company	Address	Distributor for
Metch & Merryweather Machinery Co.	23520 Woodward Ave. Detroit 20, Mich.	Oliver Instrument Co., Inc. Adrian, Mich.
Upton Bradeen & James Ltd.	890 Yonge St. Toronto, Ont., Can.	National Electric Welding Machines Co. Bay City, Mich.
Tri-Bees, Inc.	7 West Broad St. Fleetwood Station Mt. Vernon, N.Y.	The Atrax Co. Newington, Conn.

DYKEM
STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2301G North 11th St. • St. Louis 6, Mo.
DYKEM STEEL BLUE
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue

Use postpaid card. Circle No. 331

BOOK REVIEWS

ANGULAR INDEXING CALCULATIONS. Published by Pratt & Whitney Co., Inc., Charter Oak Blvd., West Hartford 1, Conn. 511 pages. *$11.00.*

An electronic brain, called the Bendix General Purpose Digital Computer, is the author which thought out and edited this new book, logging 112 hours in accomplishing the task. The men who discovered the author's ability are **Jacob J. Jaeger**, president, and **Edward E. Kirkham**, chief development engineer, of Pratt & Whitney.

What the book provides are precise tabulations for dividing a circle into any number of equal divisions from 2 to 210 inclusive. For each of these divisions, the decimal value, the degrees, minutes and seconds, and the sine and cosine are given. Accuracy is calculated to 15 decimal places. The user of these tables no longer has to plough through trigonometric equations, functions, or mathematics.

Information will be of interest to engineers, designers, and operators of such machines as jig borers, hole grinders, rotary tables, and measuring equipment.

JIG GRINDING and JIG BORING

to your specification

At your disposal: Our sub-contract jig boring department, one of the best equipped in the East.

A. K. TOOL CO., INC.
ROUTE 22, MOUNTAINSIDE, N.J.
Telephone: ADams 2-7300

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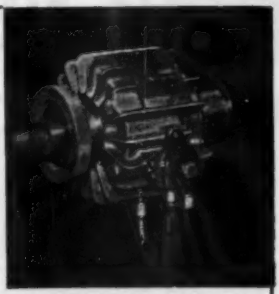
WILSON AIR COLLET CLOSER



STEP UP PRODUCTION 20%+

. . . for most lathes to 1" bar stock capacity

- Hold delicate parts without damage or adjustment
- Iron grip for heavy work
- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- Eliminates jarring of head stock

(Ten day FREE TRIAL to reliable firms)

WILSON AIR COLLET CLOSER, INC.
909 40th Ave. NE, Minneapolis 21, Minn.

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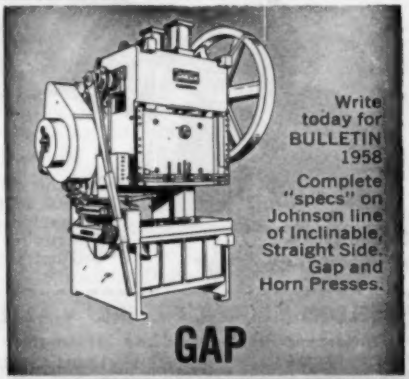

Johnson
POWER PRESSES
JOHNSON MACHINE & PRESS CORP.
620 W. INDIANA AVE., ELKHART, INDIANA

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Both NEW *and* DIFFERENT SHELDON 15" PRECISION LATHES

ER60P
5' bed—31" centers

NEW

New. Revolutionary double-box Headstock (Pat. Pend.)
New. "WORK-HOLDING ONLY" Spindle.
New. Single-Shift Back Gear Lever on Headstock.
New. Headstock and Apron running in oil.
New. 1½" Hole through Spindle.
New. 60-pitch Gear Box with built-in Lead Screw Reverse.
New. Amazing LOW PRICE.

DIFFERENT

Different. Spindle rigidly held in two large "Zero Precision tapered roller bearings arranged in box-type design.
Different. Electrical switches and push-button stations fully enclosed in built-in well in headstock.
Different. Two independent clutches in apron for selecting power feeds.
Different. Cam-action tailstock clamp for rapid release and instant locking of tailstock.
Different. Triple, cogged, V-belt outboard drive—eliminates intermediate shafts—delivers more power to spindle.

This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

Send in coupon for full information.

SHELDON MACHINE CO., INC. • 4242 No. Knox Ave. • Chicago 41, U.S.A.

Gentlemen: Please send me information on items checked.

- ☐ The NEW and DIFFERENT SHELDON 15" Lathes
- ☐ Sheldon ☐ 10", ☐ 11", ☐13" Lathes
- ☐ 11" and 13" Variable Speed Lathes
- ☐ High Speed Turret Lathes
- ☐ Sebastian 13" and 15" Geared Head Lathes
- ☐ Horizontal Milling Machine
- ☐ Sheldon 12" Shaper
- ☐ Name of Local Dealer
- ☐ Have representative Call

Name..... Title.....

Company Name .....

Street Address ..... ☐ Company ☐ Home

City..... Zone..... State.....

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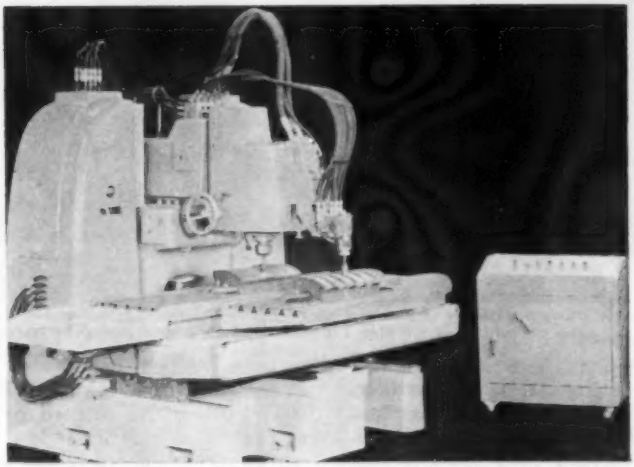

Bedmill performs as a production profiling machine, duplicator in three dimensions and as a conventional milling machine.

NEW BED-TYPE MILL IN 14 MODELS

The new Bedmill, available in 14 models and 34 combinations, is designed for the aircraft and missile fields and is useful to plastic mold shops and drop forging work. The machine performs as a production profiling machine, duplicator in three dimensions, and as a conventional milling machine. Featured are hydraulic, electro-hydraulic (automatic) tracer control for completely automatic duplicating (180°) or for production profiling work (360°), or numerical control. The basic machine lends itself to many different combinations of speeds and feeds—electrical and/or hydraulic.

The machine is available with a hydraulic spindle of from 15 to 40 hp. Feeds can be specified as all hydraulic, screw or a combination of hydraulic and screw.

Spindle speeds vary according to horsepower—215 to 3,000 rpm for the 15 hp model and 37 to 3,000 rpm for the 40 hp model. Infinitely variable speeds and lower speed ranges are available at extra cost.

Machines are also on special order according to customer specifications.

The George Gorton Machine Co., Racine, Wis.

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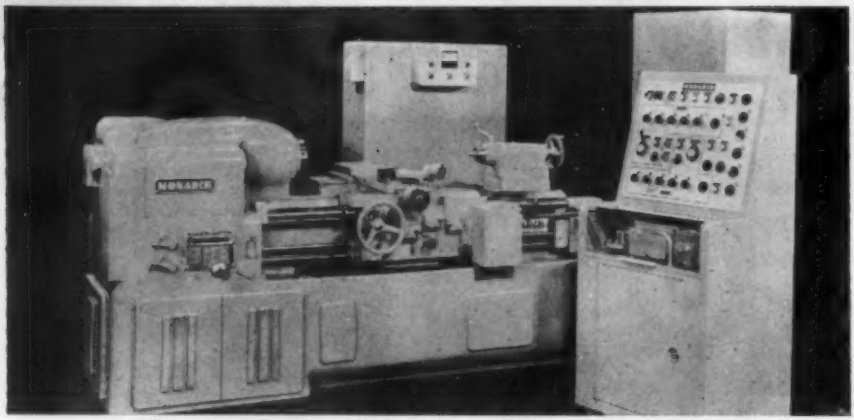
Numerical Control Added to Series EE Model 1000 Lathe



Featuring infinitely variable speeds and feeds, this positioning type of control is suitable for turning, facing and boring.

The application of positioning controls for turning, facing and boring has been made by The Monarch Machine Tool Co., to its Series EE, Model 1000 Lathe. A console, located convenient to the operator, provides numerical control through a modified General Electric Mark II unit. All of the lathe's regular control features have been retained, making the machine adaptable to conventional manual operations in a few seconds' time.

Data input is from standard 8 channel, 1" wide punched paper tape, prepared on a Flexowriter. A programmer sets up information which is punched on the tape in block form. Each block directs the dimension the carriage must move from the zero point, as well as the diameter information for movement of the cross slide. Feed rates are set up as well as spindle speeds and other auxiliary functions.

When the tape is read on the tape reader in the control console, the information is interpreted in the director cabinet and remains in memory until the proper carriage and cross slide positions are obtained. Feed-back units on the carriage and cross slide signal the director when the commanded position has been reached.

The versatility of the Series EE Model 1000 is particularly adapted for numerical control as this lathe has four infinitely variable speed ranges which are power selected. Tape commands can select any of these ranges and, through five manually set potentiometers controlling the drive motor speed, can select any one of five speeds for a given cycle. The infinitely variable 15 hp, D.C. main drive motor gives speeds from 20 to 2000 rpm.

Electronically powered feed motors drive the carriage and cross slide through gear boxes. Each gear box has a low and high feed range as well as a traverse range, all of which can be tape selected. Within each one of the high or low feed ranges there are nine preselectable feed rates ranging from .55" to 6.25" per minute in low; from 2" to 25" per minute in high. Any of these 18 feeds may be programmed. Longitudinal and cross feed rates may be separately selected. Longitudinal traverse rate is 150" per minute; cross traverse rate, 75" per minute. Both gear boxes can be manually disengaged for manual operation of the lathe.

The prepared tape is turned over to

the operator along with a companion data sheet. Setup is simple and quick. The data sheet gives the starting point for the cut so that the operator may position the tool in correct relation to the zero reference. Longitudinal and cross zero positions may be shifted by appropriate knobs on the console to bring the zero reference position on the tape to the zero position on the work piece. Spindle motor speed settings for each of the potentiometers are included on the data sheet. Accuracies of ± .001" on both diameter and length are achieved by this control system.

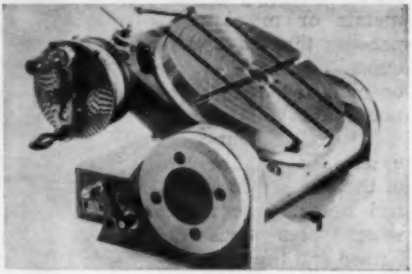
The Monarch Machine Tool Co., Sidney, Ohio.

Use postpaid card. Circle No. 82

New Rotary, Tilting-Rotary & Horizontal-Vertical Models

Karl A. Neise, exclusive U.S. distributor of Walter tables, announces the addition of new rotary, tilting-rotary and horizontal-vertical models to this line of dividing equipment.

The Walter tilting-rotary tables are available in five sizes ranging from 10" to 25" diameters. There are two series offered: the Standard Series (illustrated), reported as accurate to 30 seconds, and the Super Accurate Series, reported as accurate to 10 seconds. Optional at extra cost are Super Accurate Series models, claimed to be accurate to five seconds.



One of the Standard Series models, reported accurate to 30 seconds.

Karl A. Neise, New York, N.Y.

Use postpaid card. Circle No. 83

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3-16, 1-4, 5-16, 3-8, 7-16, 1-2, 5-8, 3-4, 1"

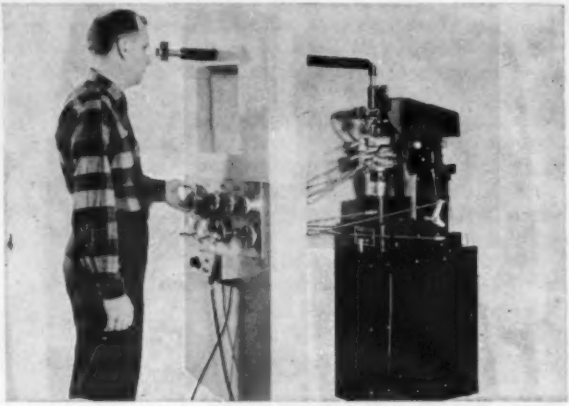
STURDY BROACHING SERVICE, INC.
23516 TELEGRAPH ROAD • SOUTHFIELD, MICH.

Write for Literature

Use postpaid card. Circle No. 336

Remote-Controlled Microhardness Tester

This mechanically operated remote Tukon tester has been designed for shallow-indentation hardness testing of "hot" metals or metal components that have been exposed to radio-active or nuclear energy contamination.



Tests "hot"" metals exposed to radioactivity.

All control functions extend through the wall of the test cell to a control panel. This tester, which uses both the Knoop and the 136° diamond pyramid indenter, employs a dual system of weights for selecting indenting loads in the range of 1 to 3000 grams or 1 to 10,000 grams. A Bausch & Lomb microscope is employed, which is equipped with three dry objectives of 10, 20 and 50 X magnification and a Ramsden Filar eyepiece.

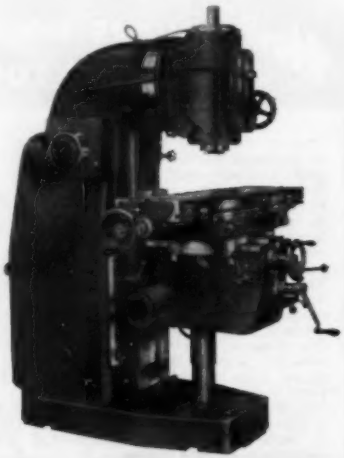
For making indentations in small selected areas, a precision mechanical stage, the Microton, is employed for

POWER PERSONIFIED

SAJO No. 2 Vertical Miller

Just a glance at this rugged machine confirms its ability to perform with ease the most demanding jobs. Sajo's swivelling head, power feed to quill and unrivaled spindle construction combine versatility with unsurpassed tool room accuracy.

Also available —
Horizontal Millers
Plain and Universal



No. 2 Vertical Miller
table size: 52" x 11"
7½ and 11½ HP motors
rapid power traverse

austin industrial corporation

76-G Mamaroneck Avenue White Plains, New York

Use postpaid card. Circle No. 337

supporting the specimen and making accurate traverses in the X (side to side) and Y (back to front) directions.

Vertical capacity of the unit is 5" without the Microton mechanical stage and 3½" with the stage. Units can be furnished to accommodate test pieces up to 8" in height.

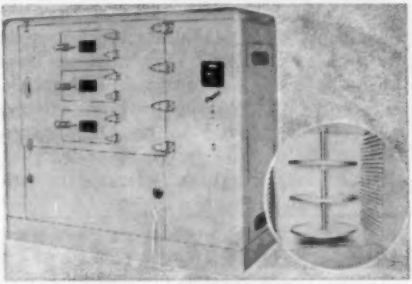
Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc., Bridgeport, Conn.

Use postpaid card. Circle No. 84

Rotary Shelf Oven For Laboratories

This new Despatch rotary shelf laboratory oven is reported to provide the extra precision control of heat uniformity required by laboratory or production workers. The rotary shelves, either manually or mechanically operated, are spaced on 12" vertical centers. The manufacturer recommends manual operation for temperatures below 300°F. For higher temperatures to the oven maximum of 850°F, there is a motor and reduction gear provided to maintain constant shelf rotation.

The new oven comes in all sizes of Despatch "V" oven series, which can

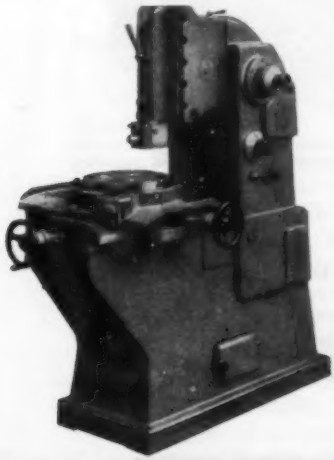


Hinged plug doors located in one main door on same levels as rotary shelf permit easy removal of product.

be supplied for gas, electric or steam heat. Even without the rotary shelf, this model is said to maintain heat uniformity within ± 1°C throughout the work chamber.

Despatch Oven Co., Minneapolis.

Use postpaid card. Circle No. 85



SPEED AND FLEXIBILITY

— with cost-cutting Vertical Shapers

Easily set up and using the simplest tooling, the CHOMIENNE M-5" with its combination of longitudinal, transverse and rotary table movements, angular ram adjustment and ram speeds up to 270 strokes per min. solves production "problems."

Also available —
Vertical Shaper, 12" with 28¾" Rotary Table, 5 HP motor.
Horizontal Shapers, plain and universal 12" to 30" stroke, 2 to 10 HP motors

5" Vertical Shaper
12½" Rotary Table
2 HP motor

austin industrial corporation

76-G Mamaroneck Avenue White Plains, New York

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Grinding & Cutting Oil

Said to be almost an all-purpose cutting and grinding oil, usable either straight or blended, the Shear-Speed H-101 has an adequate blend of saponifiables, sulphur and chlorine, heavy in E.P. value. Thus, it may also be used as an additive to increase E.P. characteristics of general purpose cutting oils. It has proved to be quite satisfactory on a wide range of operations, used either straight or blended to suit the particular application.

With excellent wetability reported, the coolant provides a good surface finish on the machining of high alloy materials such as stainless steel, monel metal and jet engine alloys. It is made with special care to assure freedom from bacteria. Thus, operators are protected from skin irritations.

Shear-Speed Chemical Products, Div. of Michigan Tool Co., Detroit.

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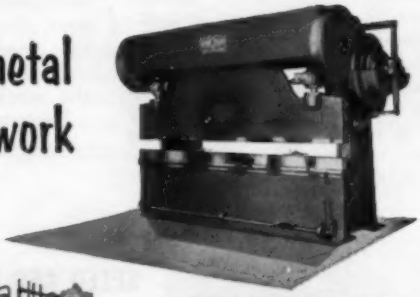
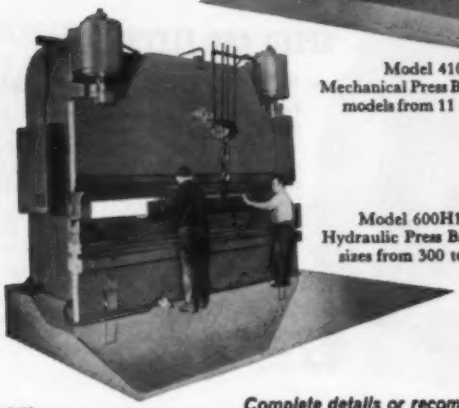
CHICAGO® PRESS BRAKES

UNEXCELLED ACCURACY

for sheet metal and plate work





Model 410D, 90-Ton CHICAGO Mechanical Press Brake. Other standard models from 11 to 450 ton capacities.

Model 600H10, 600-Ton CHICAGO Hydraulic Press Brake. Other standard sizes from 300 to 2000 ton capacities.

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Complete details or recommendations on any press brake work upon request

Press Brakes
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Special Forming Machines

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DREIS & KRUMP MANUFACTURING CO.
7440 S. Loomis Blvd., Chicago 36, Illinois

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New Series of 22 Vertical Sanders

Twenty-two geared models of high torque and light in weight, comprise the new medium duty 58S series of air-powered vertical sanders. Twelve of these models are equipped with governors. Six basic models of this class range from 1850 to 8500 rpm and expand to twelve with a choice of thumb flip or safety throttle. The ten non-governed models are similarly divided into two five-member groups by the throttle choice, with speeds from 1500 to 7200 rpm. Governed models are priced at $260 each, the non-governed at $215.

Buckeye Tools Corp., Dayton, Ohio.

A non-governed model.

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Now, with more than fifty models in the Dustkop line—plus efficient accessory items—the odds are that a standard unit will solve your problem. Dustkop units solve other problems too. They're easier to install, save space and money and are virtually maintenance-free!

how to select a dust collector

This new brochure includes all basic information needed to select the right dust or mist collector for grinding, buffing, polishing and other types of service. Write for your copy. No obligation.

AGET Manufacturing Company
1402 Church St., Adrian, Michigan

DUSTKOP STOPS DUST

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STANDARD TAPER PINS are milled from carefully selected bar stock for extremely close tolerances . . . straight to taper. The uniformity and accuracy of STANDARD TAPER PINS will save time on assembly . . . will assure you of trouble-free service. Available in STANDARD steel . . . also in stainless steel and brass. Specify STANDARD TAPER PINS and other STANDARD products.

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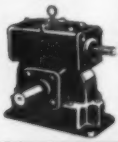
Designed and Constructed for Continuous Rugged Service

trouble-free, economical drives for any speed reduction need

Compact, precision built Abart units are available in a wide range of models from fractional to 168 hp. ratings, ratios to 10,000 to 1.

Worm, spur and combination gear models—single or double reduction—are supplied in 75 different types and sizes with any desired shaft arrangement.



Write today for Abart's hand pocket size speed reducer catalog.

ABART GEAR and MACHINE CO.
4829 WEST 16th STREET • CHICAGO 50, ILLINOIS

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Bandsaw Blade

Jet Band, a new bandsaw blade, is made from an entirely new alloy steel especially developed for band saws, and contains a high proportion of vanadium

Contains high amount of vanadium carbide.

carbide. Vanadium carbide is reported to be harder than the aluminum oxide in grinding wheels and twice as hard as carbon bandsaw blades. In tests, the bandsaw blade is reported to outlast carbon bands three to one, and matches the performance of high speed steel bands.

In addition to exceptional cutting power and ability to withstand abrasion, the bandsaw blade is also said to have high fatigue resistance and flexibility comparable to carbon bands.

A wide variety of materials may be cut, including the difficult stainless steels and high temperature alloys.

Millers Falls Co., Greenfield, Mass.

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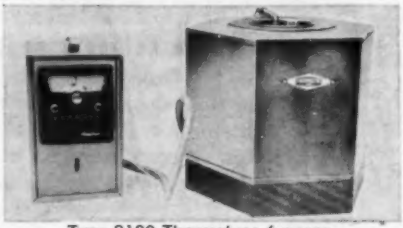
Functional Accessories For Type 2100 Thermolyne Furnace



Type 2100 Thermolyne furnace.

Accessories provided make the Type 2100 Thermolyne electric furnace even more adaptable and versatile than be-

fore as a salt bath, oil bath, melting, vertical muffle or crucible furnace. A combination of accessories may be selected best suited to the need. A single furnace will perform the several different operations, as well as save on work space.

Accessories offered include two special-alloy stainless steel pots with cover for liquid heating to 1000°F and 1600°F, a safety lifting handle for the pots, a perforated stainless steel small parts basket with lifting hand e, a perforated stainless steel skimmer for removing sludge or crust, a graphite melting ladle for use to 1700°F with no-slip lifting handle, a high-temperature refractory chamber liner, and a heavy well-insulated refractory chamber cover.

A choice of several types of controls is offered, both manual and fully automatic.

Thermo Electric Mfg. Co., Dubuque, Iowa.

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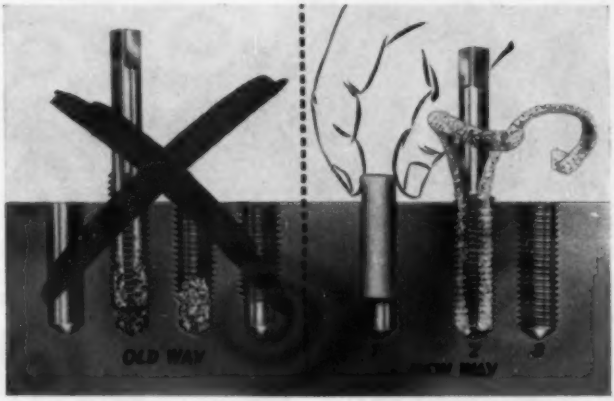
Chip problems eliminated when you tap blind holes with new *TAP CARTRIDGES*



Pictured on right shows (1) a tap cartridge (wax pellet) dropped into drilled hole. As tap works into hole (2) solid flow of wax carries chips along and out flutes as fast as chips are made. Bottom of hole is clean when taps get there. Result (3) a clean accurate hole.

- Tap to bottom of hole in one pass.
- Tap cleans itself on next hole.
- Eliminates rejects, torn threads, oversized holes.
- Extends tap life 3 to 5 times.
- No allowance for chip room.
- Obtain a smoother, more uniform thread.
- Can be used in steel, iron, aluminum, plastic and the newer exotic metals.

For FREE SAMPLES give tap size, threads per inch, depth of drilled hole. Sizes 0-80 thru 1¼". Write or phone today.

THE TAP CARTRIDGE CO. P. O. BOX 1017-T

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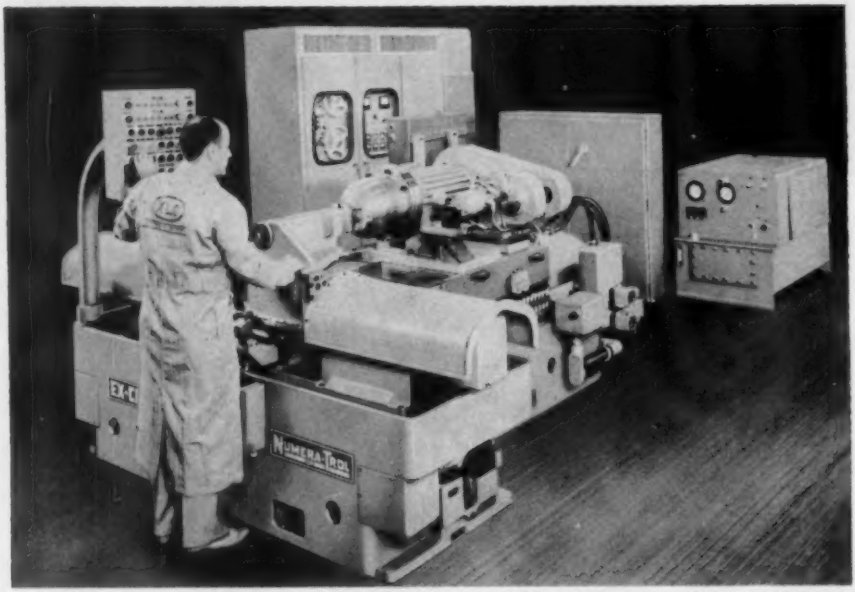
Numera-Trol Machine Controlled to 25 Millionths

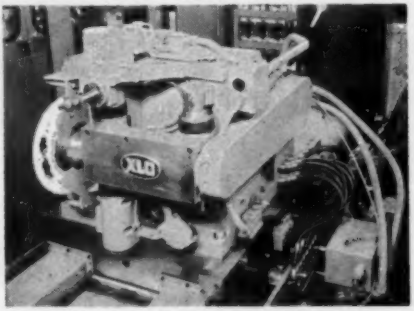


View of Ex-Cell-O Style 922 Numera-Trol contouring machine set up for producing hemispheres. Precision templet contouring is accomplished by use of an interchangeable grinding head.

Ex-Cell-O Corp. of Detroit, reports that its Numera-Trol 922, is "the most accurate production machine tool in the world."

Latest in the line of numerically-controlled machine tools, this machine is a contouring machine, designed for precision turning, boring, and grinding, and capable of being controlled—either electronically or manually—in increments of 25 millionths of an inch.

According to Ex-Cell-O engineers, radical departures from normal production techniques were adopted in the construction of the machine to make it capable of such accuracy of control. Among these departures were the design and construction of the machine bed, and of the flat and V-ways upon which the main slide and cross slide rest. The machine bed is heavier and more rigid than in standard machine tools, while the slide ways, in addition to being hand scraped to insure their being perfectly flat, incorporate precision roller bearings, matched to a few millionths of an inch to guarantee ease of movement and immediate, accurate response to directions from the



The Ex-Cell-O reciprocating grinding unit complete with automatic wheel dresser. This unit is readily interchangeable with the turning and boring head.

tape control system.

Reflecting such care in design and construction is the fact that the cross slide, which weighs approximately 1,000 lbs., requires a pressure of only 5½ lbs. to overcome inertia, and only five lbs. to maintain movement.

A typical group of components that may be machined on the contouring machine.

To insure that the slide ways are parallel the machine is tested by an instrument which is accurate within 1½ millionths of an inch and checked regularly with the U. S. Bureau of Standards.

To maintain accuracy during production operations, the machine is operated under a constant temperature of 72°F. Heat from the electronic equipment is ducted away from the work area, and the hydraulic power unit is water cooled.

Other features of the new machine include its building-block design, with interchangeable machining units, one for turning and boring, the other for precision grinding.

In addition to extreme accuracy, Numera-Trol also combines many other benefits of numerically-controlled machines, including lowered cost of short production runs, reduction of time necessary to change from one job to another, increased output, and improved quality.

Ex-Cell-O Corporation, Detroit.

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A RIGHT HAND TOOL

Release Button for Movable anvil on right hand side enables operator to hold tool the conventional way.

NEW! Resetting to Zero in Seconds. Quick Adjustable Tolerance Hands. HEAVY TUNGSTEN CARBIDE tipped Measuring Anvils. STAINLESS STEEL, one-piece spindle and screw, hardened with Ground Threads — Permanently Rustproof.

WILL DETECT OUT-OF-ROUNDNESS — OVALNESS — TAPERED CONDITION IN 1/10,000"

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Here is a SUPER PRECISION MEASURING MACHINE for the measuring of small and delicate parts for Tool and Instrument making.

Reading .000050" from dial. Directly reading in .0001" from micrometer, 1-3/4" thimble dia. Dull chrome finished.

USE IT AS A COMPARATOR

Anvils RETRACTABLE for rapid repeat measurements. Adjustable Tolerance Hands. Instant Zero adjustment of Indicator.

FEATURING . . . Adjustable Measuring Pressure to any desired tension. Non-rotating Spindle assuring absolute parallelism of anvils.

Eleven Types of INTERCHANGEABLE Measuring Anvils available.

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JIG BORER

The Linley will meet the most exacting requirements and save you money by releasing your larger bores for heavier jobs. It's precision tool . . . versatile and flexible; easy to set up and fast operating. Write to receive complete information on the many improvements that are now standard on this borer.

Table Size: 7" x 17½"
Table Travel: 6½" x 10"

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Hand Finishing Bottlenecks
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Reciprocating Tools

These handy tools will cut out many tedious hand filing and finishing operations—Increase Production—Produce Uniform Work.

Light in weight — Delivers ⅛" or ⅜" fixed stroke at 1000 strokes per minute—Operates on 110 volts AC or DC.

ACME TOOL CORP.
73 WEST BROADWAY NEW YORK 7, N.Y.

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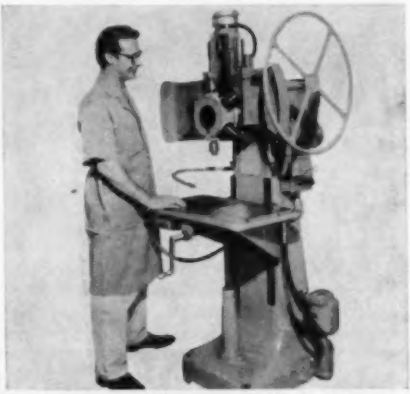
Improved Turret Drill

Improvements in the design of the transmission and the turret spindles of the Burgmaster 1C turret drilling machine are said to provide a smoother, stronger, trouble-free drive which improves accuracy and finish.

Modifications in the transmission use an electric clutch for high speeds and an over-running roller clutch for low speeds arranged in tandem for compactness and simplicity.



Changes were made in transmission design and turret spindles.

Long-serving clutch elements automatically shift to supply pre-set speeds to six spindles in the turret ranging from 325 to 4050 rpm. Only the spindle in the work position turns and the turret power indexes at operator command. Pre-selective skip-indexing as an option automatically rotates the turret to by-pass an idle station not tooled for a set-up. Pre-set depth stops control machining within ± .002".

Separate keyed gears in the forged turret spindles are replaced by integral helical gears in the new design.

Burgmaster Corp., Gardena, Calif.

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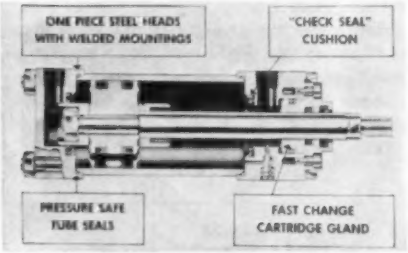
Air & Hydraulic Cylinders

The Powrmation Series low pressure air and hydraulic cylinder line is available in 1½" through 8" bores, with

capacities of 250 psi air and 400 to 1,000 psi hydraulic, depending on bore size.

Features include mountings welded to one-piece steel heads for added



Cylinder is stronger, more leak-free.

strength, pressure safe tube seal to guard against leakage, and a check seal cushion to minimize destructive effects of heavy loads.

A wide variety of mountings, rod diameters and rod ends makes the cylinder adaptable to practically any installation. Strokes can be made to any practical length. Options and accessories offer great flexibility. A choice of packings meets high or low temperature requirements.

Hanna Engineering Works, Chicago.

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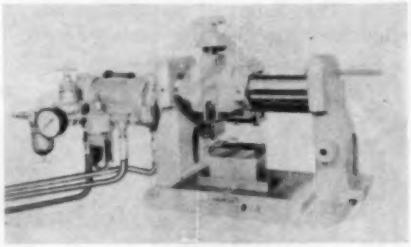
Improved Air Powered Marking Machine

75 psi and up provides power for an improved Model 9A marking machine,


75 psi and up provides power.

which is suited to operation from the standard air-line common to mostly every plant. The machine meets most

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the original, patented spring loaded live centers
JAM PROOF
GREATER LOAD CAPACITY
LESS OVERHANG MEANS MORE RIGIDITY... MORE WORKING RANGE
AUTOMATIC THRUST ADJUSTMENT
Spring loaded spindle maintains constant tail stock thrust.
LONGER LIFE
Needle bearing distributes bearing stress over greater surface, thus holding close tolerances for much longer time.
FASTER SPEEDS
Smaller turning radius gives much higher RPM rate than ordinary live centers.
CONVENTIONAL LIVE CENTER
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Write Today for Complete Information
CONCENTRIC TOOL CORP., 2486 Huntington Dr., San Marino, Calif.
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marking needs of medium and small parts manufacturers.

The air cylinder has been purposely designed and developed to provide ample power in a minimum of space. The stroke of the machine is 6" but may be up to 14" in the extended model.

The rotary "point of contact" principle is used. Roll dies mark flat parts and flat dies mark round and cylindrical parts. The "point of contact" principle eliminates the need for massive equipment for "one impact" marking of an entire area. This improved method provides greater pressure with smaller equipment by "accumulative marking" rather than heavy impact.

The clearing under the marking head is 6" front and 3½" rear. Solid engraved marking dies or holders with type or inserts may be used. The machine comes with or without a steel bench-cabinet.

The Acromark Co., Elizabeth, N.J.

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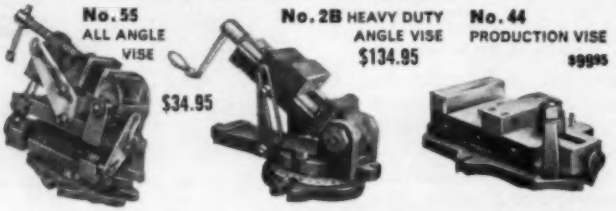

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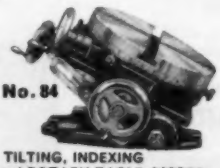
Get this FREE Catalog NOW on work holding tools, showing 68 models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories, with jaw sizes from 1½" to 8" showing details and prices.



No. 84 TILTING, INDEXING and ROTARY TABLE $139.50

CHICAGO TOOL & ENGINEERING CO.
8384 South Chicago Ave., Chicago 17, Illinois

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Splined Milling Arbors Speed Machining High-Strength Alloys

A radical improvement in heavy duty milling performance, particularly in the machining of modern, high-strength alloys in the hardened state, is claimed for the new splined milling arbors and cutters recently introduced.

Both the arbors and the spacers used with them are splined. As a result,

Splined milling cutters and arbors.

resistance to torsional deflection of the assembly is said to be much greater than that of a plain arbor of the same size. It is claimed that this added resistance to torsional deflection greatly reduces backlash.

The milling cutters used with these arbors are also splined. Precisely positioned on the accurately ground ID of the splines, they are driven by the sides of all 6 splines—not by a single soft metal key. As a result, the take-up nut need only be brought up to "hand tight" with a wrench; no extra leverage or hammering is required.

This new Pratt & Whitney line includes splined milling arbors, cutters, spacers, and flywheels. Both the splined cutters and arbors can be used interchangeably with conventional plain types of the same size. Splined milling arbors, with 50 MM taper, are made in 1", 1¼", 1½" and 2" diameters in standard lengths; other lengths on application.

Pratt & Whitney Co., Inc., West Hartford, Conn.

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Rust a problem? Relax . . . Rust-Lick "B" guarantees

100% CORROSION CONTROL in aqueous systems

- Recommended for use in hydrostatic-testing; washing or tumbling; heat treating; additive to soluble oil.
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OFFSET BORING HEADS

UNPARALLED
• ACCURACY
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• DURABILITY

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PRECISION TOOL & MFG. CO. of ILLINOIS
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Burgmaster Automatic Turret Drilling Machines

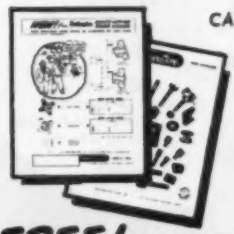
An improved hydraulic feed, for the Burgmaster Models 2 BH and 3 BH automatic turret drilling machines, compensates for temperature variations which normally affect feed rates when hydraulic systems are employed. The new temperature-compensated oil flow control will maintain constant feed rates under normal operating conditions. Feed rates can be dial calibrated and a setting can be made reliably.

New Burgmaster automatic hydraulic turret drilling machines are equipped with the improved system. Machines already installed

Burgmaster 3 BHT with 30" x 45" positioning table and General Electric numerical control.

!NEW!
QUICK-ACTING
HAND KNOBS

ALUMINUM CAST IRON



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T-Nut & Stud Sets
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Cut Thread Studs
Tee Nuts
Coupling Nuts
Adjustable Step Blocks
Strap Clamps (Plain & Step Type)

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Northwestern
118 HOLLIER AVE., DAYTON 3, OHIO
NORTH WESTERN

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can be equipped with this control. A do-it-yourself changeover kit is available for those desiring it.

Burg Tool Manufacturing Co., Gardena, Calif.

Use postpaid card. Circle No. 95

Flexible Rubberized Magnetic Belting

A new magnetic product affords flexibility with the cushioning effect of rubber. The belting will not mar delicate metal parts.

As a permanent mask for paint spraying, the rubber magnet can be used over and over again, even on curved surfaces. Attached to an inclined conveyor cloth belt, it eliminates the need for a magnetic head pulley.

The material comes in different thicknesses and shapes—1/32" to 5/16" thick x 3" wide x 24" long.

Storch Products Co., Inc., Detroit.

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You can't afford it!

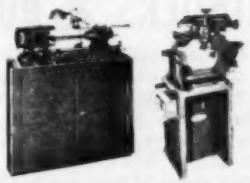
As the pictures show, taps cost roughly 6 times as much as drills. Yet it's common practice to resharpen the drill — and throw away the tap.

It doesn't make sense. And it's an awful waste of money.

That's where Blake comes in.

Blake makes low cost, high-precision tap grinding equipment. These easy operating tools can make your taps last up to 6 times longer . . . reduce work spoilage . . . enable taps to cut more accurately and uniformly with less strain . . . cut tap costs as much as 65%.

It's surprising how many people overlook this proven, basic method of saving money. Be sure you don't. Ask us for complete information.



Blake Chamfer Grinder/Blake Flute Grinder used in combination, create or restore:
1. exact indexing of cutting edges.
2. controlled rake angles for each job.
3. correctly ground spiral points.
4. perfectly relieved chamfers . . . make one tap do work of six!

EDWARD **BLAKE** COMPANY, INC., DEPARTMENT 12, 570 PLEASANT STREET, WATERTOWN, MASSACHUSETTS WA 6-0100

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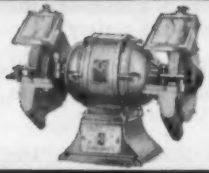
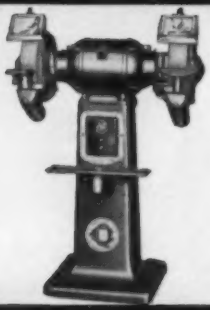
BUY the BEST



for LESS !



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GRINDERS & BUFFERS

Your first savings . . . when you buy QUEEN CITY Grinders and Buffers . . . is only the start! You save 20 to 30% . . . get extra heavy spindles, extra duty ball bearings, special motors . . . extra long, low-cost service. Prove it with 30-Day Trial Offer!

Complete range of floor and bench types, from ⅓ to 10 H.P.

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3912 Kellogg Ave.
Cincinnati 26, Ohio

"High Quality—Low Cost—For Over 50 Years"

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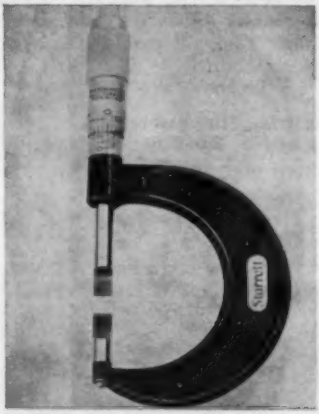
Blade Type Micrometers Measure in Narrow Spaces



Measures depths up to 5/16".

A line of micrometer calipers with blade-type anvils and spindles, Starrett's No. 486 Series, will measure depths of narrow grooves, slots, keyways or recesses or measure diameters between lands, fins or ridges such as on circular forming tools. Only .030" thick, the anvil and spindle will measure depths up to 5/16".

Five size ranges are offered—0-1", 1-2", 1½-2½", 2½-3½", and 3½-4½". All are graduated to read in thousandths of an inch.

The L. S. Starrett Co., Athol, Mass.

Use postpaid card. Circle No. 97

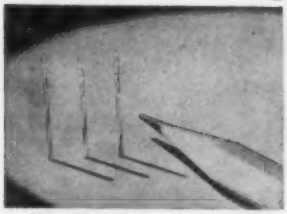
New Line Of Detachable Arbors And Adapters

The availability of a new extensive line of detachable milling machine arbors and adapters with live bearing supports has been announced by J & S Tool Co. of Livingston, N.J. All the arbors and adapters in the new line, known as J & S "No-Bend," are hardened and ground to prevent set.

Designed for quick change, the arbors are claimed to be interchangeable with 40 to 50 taper adapters, permitting more continuous milling machine use and greater production.

Use postpaid card. Circle No. 98

Micro-Precise Drilling Possible With New Drill



Wire sizes Nos. 61 thru 80.

Use postpaid card Circle No. 99

Made in wire sizes numbers 61 through 80, with diameters ranging from .0135 to .0390, the new Atrax Series 1815 solid carbide drills fill out the complete line of wire drill sizes from No. 1 thru No. 80. Solid carbide throughout, the "Micro-Drill" is precision ground, standard right hand spiral, has straight shank, machine ground point, and is right hand cutting. It is especially recommended for drilling plastics, fiber, carbon, etc. Drill dia. is kept to tolerance of +.0000 —.0005. 20 new sizes are offered. Atrax Co., Newington, Conn.

"CLEVELAND"

SQUARING SHEAR BLADES

Made in 3 grades:

"Peerless" (high carbon high chrome)

"Century" (high alloy)

"Standard" (low alloy)

Used by practically EVERY manufacturer of squaring shears as original equipment. Because they are ground to the closest tolerances in the knife industry — "CLEVELAND" shear blades insure maximum cutting life . . .

We make a complete line of knives and shear blades for every industrial need. We have learned a lot about YOUR problems in the past 40 years — ask us.

Manufactured and sold by:

THE HILL ACME COMPANY

CLEVELAND KNIFE DIVISION

1201 West 65th St. • Cleveland 2, Ohio

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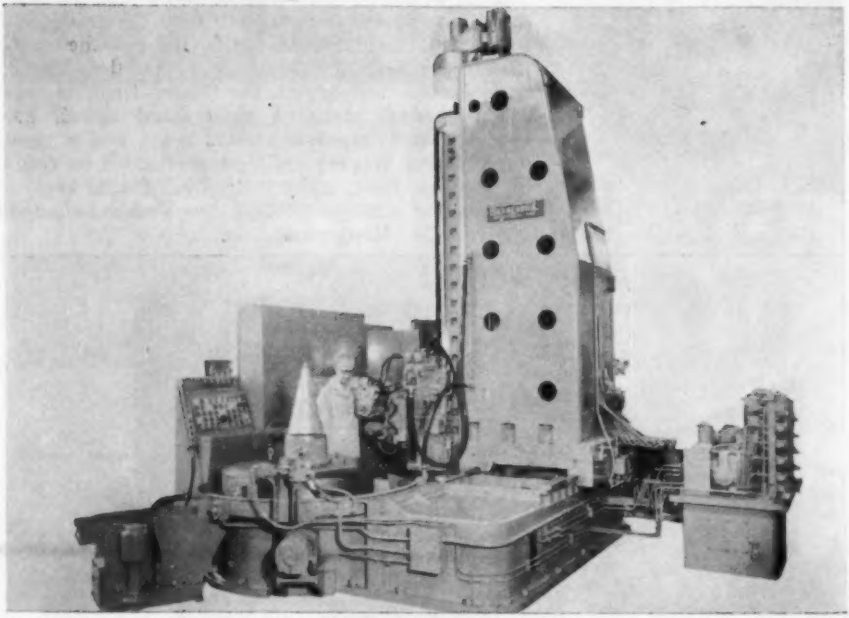
4-Motion Programming



Barnesdril numerically controlled drilling and tapping machine with vertical travel, two spindle combination drilling and tapping head.

This numerically controlled drilling machine is capable of programming four motions—two more than earlier models could handle, it is reported. The horizontal two spindle drilling machine can drill and tap cylindrical sections with maximum diameters of 36" and maximum height of 72", conical sections, and ojival sections—curves with a configuration not exceeding plus or minus 15 degrees off horizontal center.

The unit employs vertical spindle movement with air counterbalance, in and out column travel movement of 24", and a rotary table 40" in diameter for positioning the part being machined. The machine will perform combination drilling and countersinking, combination drilling and counterboring, straight drilling, reaming, counterboring, countersinking, and tapping. Holes can be spaced equally or unequally with accuracy of ± .003 reported for true position, and repeatable accuracy of ± .0005.

The rotary table motion, which is powered by a ¾ hp motor, can be indexed through 360° from the given reference point at a speed of 1.25 rpm.

The numerically positioning control is operated from information punched in standard 8-channel Flex-O-Writer tape.

The controls on the machine also perform the auxiliary functions of supplying instructions for machine and for the operator.

So that controls are completely flexible for manufacture of different parts, all positioning of machine motions as well as operator and machine instructions is done simultaneously from the information punched on the tape.

Barnes Drill Co., Rockford, Ill.

Use postpaid card. Circle No. 100

Tough Grinding Wheel Forms Dressed Easy as A, B, C

eliminate elaborate set-ups and operations

.0001" ACCURACY

Fluidmotion
WHEEL DRESSERS
dress two angles tangent to a radius in one continuous motion

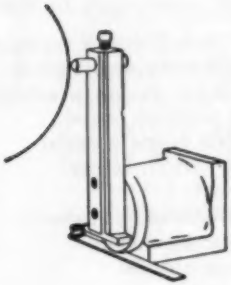
With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Adaptable to all type cylindrical and surface grinders.

A. Obtain micrometer reading; add required convex radius or subtract required concave radius.

B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.

C. Tighten jib. Set stops for two angles. Ready for action.



Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave.

See your industrial distributor or write for free literature.

J&S TOOL CO. INC.

J & S TOOL CO., INC.

CLAMPCUT

880 DORSA AVE.
LIVINGSTON, NEW JERSEY

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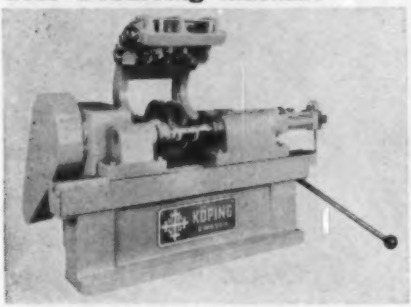
Gear Deburring Machine



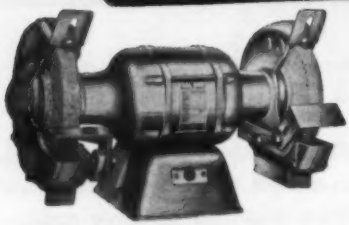
The Swedish Koping factory has released information on a semi-automatic gear chamfering and deburring machine. It is said to work clusters of one to five gears in a single operation. The capacity is 7" swing on 16" centers.

The chamfering operation is done by case-hardened master gears and the deburring by cutter bits or files. The machine is designed mainly for helical gears but can be adapted for spur gears as well.

Homestrand Machine Tool Corp., Greenwich, Connecticut.

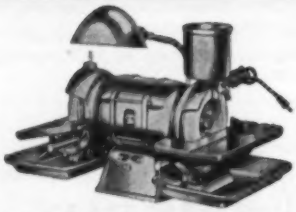
Use postpaid card. Circle No. 101

MOST *Value-Packed* GRINDER MADE!



only $112.00

CARBIDE TOOL GRINDER



Model 153—6". Reversible ½ HP motor, 3450 RPM. 1½" wide wheels. Every part oversize for rugged, long-lasting use. Just $201.80

BALDOR

MODEL 153—8"

Feature for feature, no other grinder offers so much for so little. Compare HP rating, wheel size, shaft diameter, bearing size with any other similar-type grinder. You'll quickly see why you get *more* with *Baldor!*

- Big ½ HP motor; won't burnout even if repeatedly overloaded!
- Wide-clearance design provides maximum working room!
- Large 8" first grade wheels!
- Heavier ¾" arbor; larger ball-bearings!
- Dynamically-balanced rotor—extra smooth operation!
- Exhaust-type guards!

Write today for Bulletin 321N on complete line of Baldor Grinders and Buffers!

BALDOR ELECTRIC CO.
4353 DUNCAN AVE. ST. LOUIS 10, MO.

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INCREASES PRODUCTION...

LOWERS COSTS...

PAYS FOR ITSELF QUICKLY...

The ROUSE HAND MILLER is a widely used, inexpensive, high speed, ball bearing, motor driven machine for handling light cuts in brass, aluminum, steel, plastics, and other materials—fast, accurately, and at very low cost.
*Only $116.00**

Fixtures (illustrated) extra.

*Motor equipment:—¼ H.P. 110 Volt AC 60 Cycle, single phase, swivel motor mount and light—$45.00**

**All prices FOB Chicago.*

- ★ **MILLS SMALL PARTS MUCH FASTER.**
- ★ **DRASTICALLY CUTS YOUR INVESTMENT IN EQUIPMENT.** Replaces expensive production machinery—or releases it for other jobs.
- ★ **INEXPERIENCED HELP CAN OPERATE IT.** Safe, simple fool-proof operation.
- ★ **NO MORE COSTLY SET-UP TIME. $116.00** price so low that it pays to keep one or more Hand Millers always set-up for special operations.
- ★ **YOU GET A BETTER PRODUCT**—the result of ABSOLUTE ACCURACY.
- ★ **A LOSS BECOMES A PROFIT** when marginal pieces are finished on the Hand Miller instead of on high cost equipment.
- ★ **VERY LOW MAINTENANCE.**
- ★ **USED REGULARLY IN 1163 MANUFACTURING PLANTS** (some of which use as many as 30 machines)—yet on the market a scant few years.
- ★ **UNIQUE—VERSATILE.** Nothing else like it. One or several machines can be the answer to some of *your* production problems.

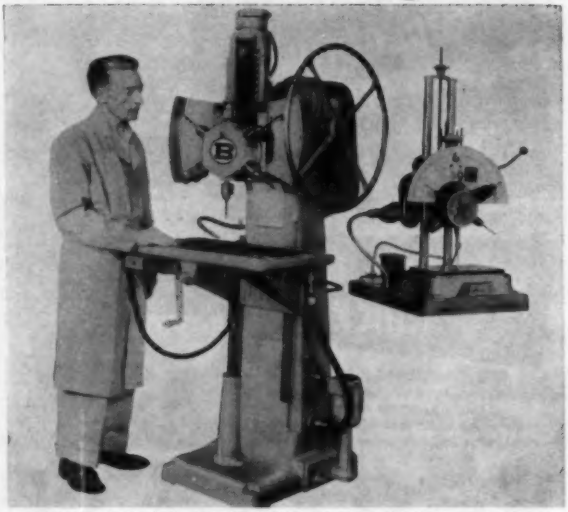
Write today for further information

H. B. ROUSE & COMPANY
2214 N. WAYNE AVE., CHICAGO 14
50 YEARS OF SERVICE TO INDUSTRY

Use postpaid card. Circle No. 359

Turret Drilling Machines Eliminate Fixture Shuffling

The new Model 1C six-spindle turret drilling machine has been added to the Burgmaster line as a companion to their bench Model O machine. This offers two standard sensitive drilling machines with the advantage of the turret principle for increasing the range of applications. The Model O drills up to ¼" dia. in steel, the Model 1C, ½" dia. in cast iron.



Power indexing turrets index at operator's command.

Machining operations which are typical of a line of single spindle drills are now reported as performed at one position, eliminating fixture shuffling and hundreds of miles of walking by operators.

Both machines have power indexing turrets which index at the operator's command. Spindle speeds and depth

For extreme accuracy under heaviest radial and thrust loads...

Specify **RED-E** ANTI-FRICTION **CENTERS**

BULL PIPE

LATHES: 30 MODELS
GRINDERS: 22 MODELS

Stocked in all standard taper sizes and straight shanks. Immediate delivery on head sizes up to 12" dia.

Model HD-500-700 illust.

FEATURE: 3 & 7 ABEC-SPEC bearings. Heads made of chrome nickel steel, hardened for greater resistance to abrasion wear. HD model has an adjustable bearing assembly with positive locking control.

CALL YOUR DISTRIBUTOR OR WRITE

Center Specialists Since 1908

OTHER HEADS AND SHANK SIZES AVAILABLE

RED-E TOOLS **READY TOOL COMPANY**

168 Garfield Ave.
Stratford, Conn.

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THE ABC'S OF PRECISION ROTATION

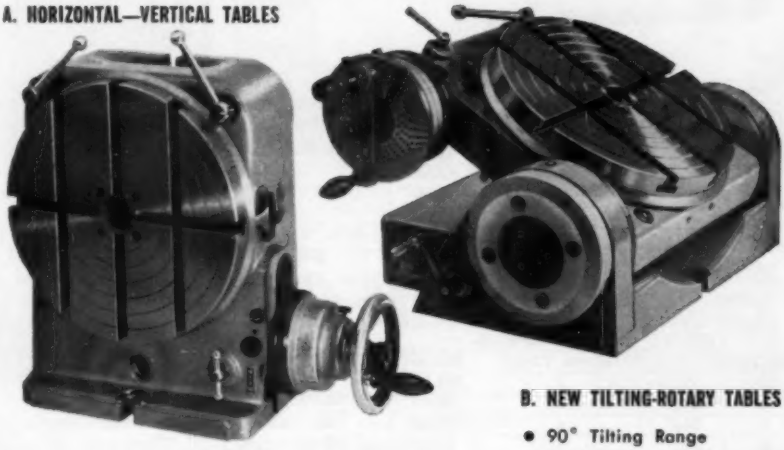
WALTER TABLES

FOR ANY COMBINATION OF INDIRECT, DEGREE, AND/OR DIRECT INDEXING

TWO SERIES NOW AVAILABLE:

STANDARD: 30 SECOND ACCURACY-6 SECOND VERNIER READINGS.
SUPER ACCURATE: UP TO 5 SECOND ACCURACY—2 SECOND VERNIER READINGS.
ALL MODELS FEATURE HARDENED, PRECISION GROUND WORM GEARS, IMMERSED IN OIL FOR LONG LIFE AND ACCURACY.
ALL WALTER TABLES ARE SOLD WITH A REGISTERED GUARANTEE.
ACCESSORIES FOR ALL TABLES ARE AVAILABLE.

A. HORIZONTAL—VERTICAL TABLES



B. NEW TILTING-ROTARY TABLES

- 90° Tilting Range
- 5 Sizes from 10" to 25" dia.
- Tilting Angles can be read to one minute

C. NEW ROTARY TABLES

- 6 Sizes form 10" to 31½"
- Supplied with or without coolant chamber

WRITE FOR COMPLETE CATALOG

EXCLUSIVE DISTRIBUTOR

KARL A. NEISE
Dept. MT-20, 404 4th Ave.
New York 16, N.Y.

NEISE MODERNTOOLS

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control are pre-selective and are automatically shifted as the spindle indexes.

The machines are used in precision sensitive drilling of small parts such as are found in the electronic, electrical field, aircraft, missiles, and manufacturing of all types.

Burgmaster Corp., Gardena, Calif.

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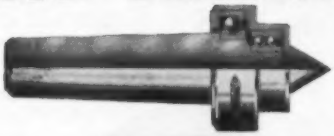
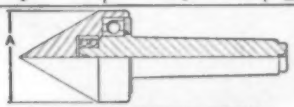
LIVE CENTERS



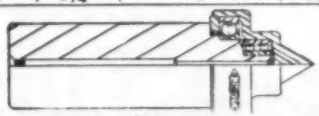
LIVE CENTERS

Head No.	Morse Taper	Price
2	2	$28.00
3	3	32.50
4	4	40.00
5	5	52.00
6	6	75.00
7	7	295.00



TUBING CENTER SPECS.

Hd. No.	"A"	Morse Taper	Price
2	1⅞"	2	$32.00
3	2⅜"	3	40.00
4	2¾"	4	43.00
5	3¼"	5	57.00



STRAIGHT SHANK CENTERS

Hd. No.	Shank Size	Price
3	1"	$40.00
4	1½"	53.00
5	1¾"	65.00
5	2"	75.00
6	2½"	85.00

Head of any other size and shape can be furnished to specs. Standard shanks made with Morse tapers, other tapers special, always specify Head and Taper—4 page catalog on request.

STURDIMATIC TOOL COMPANY
3970 F St., DETROIT 16, MICH.

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Chip Problems Eliminated By New Wax Tap Cartridges

A new-formula wax pellet tap cartridge has been developed which is said to completely eliminate the many chip problems encountered in blind hole tapping.

The cartridge is dropped into the

Tap cartridge inserted in drilled hole, actual tapping operation, and finished clean threaded hole.

hole, and as the tap works its way into the hole, the wax carries the chips out the flutes. The last chips remain imbedded in that portion of the tap cartridge still in the flutes, and are withdrawn with the tap. Results reported are a smoother more uniform thread, with tap breakage minimized.

The cartridges are available in sizes 0-80 through 1¼". They can be used in steel, iron, aluminum, plastics, and the newer exotic metals.

The Tap Cartridge Co., Cincinnati.

Use postpaid card. Circle No. 103

HARCO **STANDARD FIXTURE CLAMPS AND DETAILS**

Save Tool Room Time!

Precision-machined, hardened, rustproofed. Fast delivery from stock! Cut design time, increase tool room production and save many manhours by specifying STANDARD HARCO FIXTURE CLAMPS AND DETAILS.

Write for free catalog today!

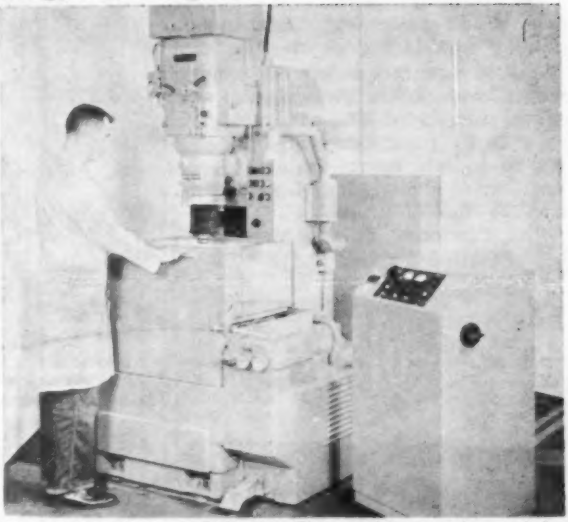
HARCO ENGINEERING
12092 Woodbine Avenue
Detroit 39, Michigan

Use postpaid card. Circle No. 363

Electrical Discharge Machining For Accurate Tool Sharpening, Surfacing

Cincinnati Milling Machine Co. recently introduced a new Elektrojet line of 33 building-block machine tools for electrical discharge machining. These machine tools are constructed on building block principles, and share between them the option of two bases, two slides, four workheads, four base-tank units, and four power supplies.

These machines will be used for diesinking, for machining "unmachinable materials," for cutting holes and pockets of odd shapes, and for jobs on which burrs, brittleness, warpage, or hardness make older



The Cincinnati No. 1 Elektrojet. This machine can be used for forming, piercing, die sinking, and surfacing any electrical conductive material.

Helios

DIAL CALIPERS

Model UR68E

$31.15 (Without Case)

Sizes: 6" (illustrated)
8" and 10"
from $31.15
(without case)

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VERSATILE, ACCURATE, TIMESAVING, EASY TO READ

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ONE OF MANY

NEISE MODERN TOOLS

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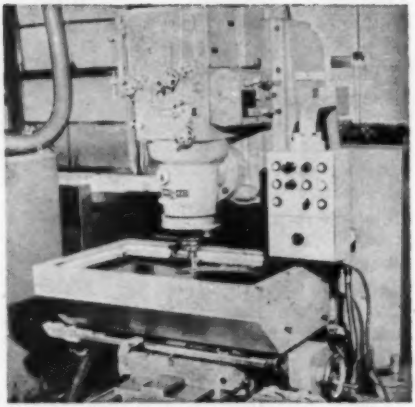
machining methods impractical.

No operator appears in the illustration because electrical discharge machining on this Elektrojet is an automatic process, requiring no attention once the part has been set up. This model is equipped with a movable work table with fixed tank, and universal workhead which can impart vertical, angular, rotational, and planetary motion to the electrode.

The Cincinnati Milling Machine Co.



No operator attention is needed once set up.

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Smooth Hydraulic Pressure Affords Controlled Marking

Designed as a completely self-contained "in line" marking station, the Model 465 marking machine is conveyor fed and discharged. Parts are positioned into retractable cradle nests by a hydraulic shuttle feed for marking. After positioning, a hydraulically operated die slide, with lettering tool in marking position, rolls the legend into the periphery of metal parts. Since parts are being marked with consecutive serial numbers, each successive number is indexed automatically on the return stroke of the die slide. The entire marking cycle is completely automatic.

A 2 hp, 220/440 volt three-phase 60 cycle motor powers the model.

QUALITY ACCURACY COLLIS DURABILITY SERVICE

USE-EM-UP TYPE

STANDARD TYPES

SLEEVES

AND

SOCKETS

AND A

complete line of COLLETS

● COLLIS Taper Tools are made by men skilled in this type of manufacture. Users get long satisfactory service from COLLIS Equipment and find the answer to all drilling, reaming, and tapping needs in the Collis line. We can give prompt service on orders for Lathe Centers, Arbors, Drill Drifts, and Magic Type Chucks as well as on Sleeves and Sockets and Collets.

THE COLLIS CO.

DEPT. A, CLINTON, IOWA

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GEARS

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send in your blueprints and inquiries.

Send for Complete Catalog No. 18a

CHICAGO GEAR WORKS

440-50 N. Oakley Blvd., Chicago 12, Ill.

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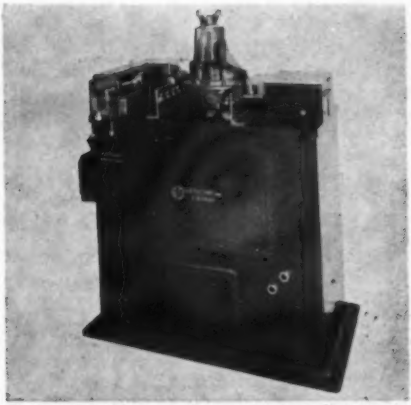


Equipped with a roller conveyor fixture to mark gear carriers.

In the illustration, the model is equipped with a roller conveyor fixture to mark gear carriers. A wide range of round parts can be individually adapted to "mass production" marking when this marking machine and GTS custom engineered fixtures are combined as a unit.

The machine can be equipped to use type or die holders for marking, as well as numbering heads, depending upon specific marking needs.

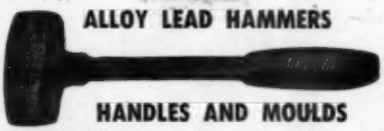
Geo T. Schmidt, Inc., Chicago, Ill.

Use postpaid card. Circle No. 105

Saw For Slicing Carbon Bars

A new saw for slicing carbon bars, designed for high speed cutting, utilizes a 10" diameter circular blade and a 5 hp drive motor. With a multiple cut-

BALANCED ALLOY LEAD HAMMERS



HANDLES AND MOULDS

1, 1½, 2½ and 5 lb. sizes—order your alloy lead hammer requirements from your mill supply house.

or direct from:

KITZMAN MFG. CO.

Manufacturers Of Lead Hammer Products

15061 Hartwell Ave. Detroit 27, Mich.

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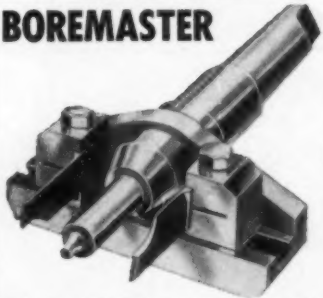
BOREMASTER



For Holes and Cores in One Operation

Bores a 6" hole in 3 1/4" Machine Steel in 6 minutes.
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- Rigid and Heavy-Duty
- Saves Time
- Saves Material (cores intact)
- With or Without Retractable Pilot
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- Write for the illustrated catalog and learn of the other advantages meaning HIGHER PROFITS FOR YOU

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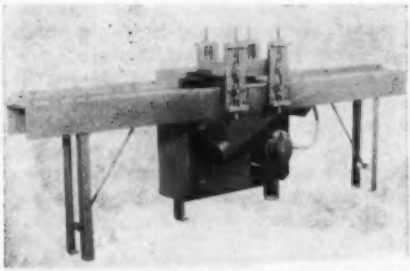

Handles stock 2¼" thick, 10¼" wide, 36" long.

ting head, the machine is said to make up to nine slices simultaneously. Blade speeds can be varied to suit specific cutting operations. It will handle stock 2¼" thick x 10¼" wide x 36" long.

The machine is equipped with power feed for production cutting, with powered rollers above and below the work, set on each side of the blade.

W. F. Wells & Sons, Three Rivers, Michigan.

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Model 2RH Mist Coolant Generator

Because it features . . .

- Compact stainless steel nozzle
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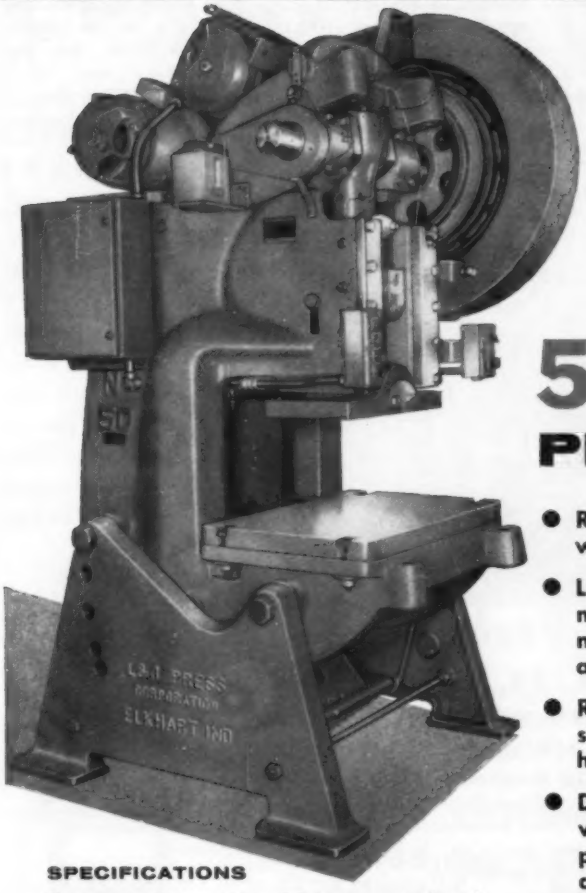

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50 SERIES PRESSES

- Readily adaptable to wide variety of work.
- Large box-type slide, mounted in long gibs, maintains accurate alignment.
- Rigid frame design resists deflection under heavy work loads.
- Dies mate perfectly — wear is minimized. Close product tolerances stay close.
- Proven L&J features insure long dependable service, cut maintenance.

SPECIFICATIONS

Two capacities—50 or 60 tons, geared and non-geared models. Slide face 24" x 12". Bolster 36" x 24". Opening through back 22". Shut height 11"*. Slide stroke 4"*. Slide adjustment 3". *or to suit

Write for catalog.

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Tap Extensions For "Awkward-Spot" Tapping

Ritmar Corp., Huntington, New York.

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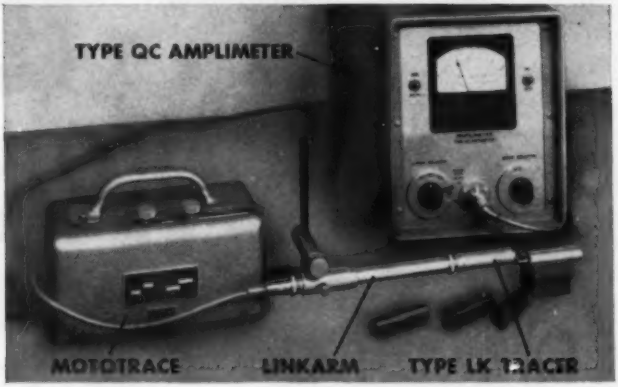
Short Series tap extension Type 707, particularly for machine tapping, has been introduced by Ritmar in addition to its 9" models. The 5" long 707 holds tap sizes from No. 0-½" and offers advantages for "awkward-spot" tapping. Using the extension, with standard taps, the delay in procuring special long taps (from 6" to 8½") can be eliminated. Three series are offered: 707-A, for tap sizes from No. 0-No. 6; 707-B, No. 8-¼", and 707-C, 5/16"-1/2". As a new feature, the 707-C has shanks turned down to a ⅜" dia.: in the smaller series, ⅜" or less.

NEW! Profilometer® GROUP III



Measures Roughness of Surfaces from ⅛" to Flat — ID and OD

NEW Type LK Tracer measures on ID's and OD's as small as ⅛"; flats; tapers; narrow splines; gear teeth.

NEW Type QC Amplimeter shows roughness from 0 to 1000 microinches (arithmetical or r.m.s.) on easy-to-read meter. Has 3 standard roughness width cutoffs. Lightweight and portable; built for shop use; factory-calibrated for dependability.

WRITE for descriptive literature.

Profilometer is a registered trade-mark.

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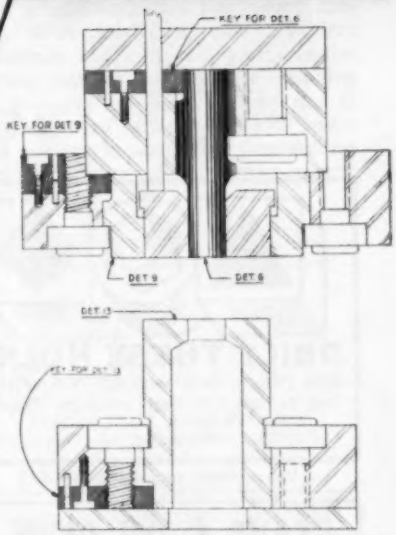
NEW HOVIS KEY-ALIGNED DIE

THE LATEST ADDITION TO OUR STANDARD UNITS

a must for irregular stampings

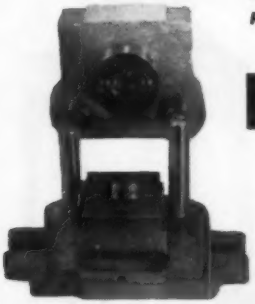


A section line drawing showing the principle of the Hovis key-align method.

ELIMINATES ALL SET-UP ERRORS AND INSURES UNINTERRUPTED ACCURACY

When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.

An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:
¾"-1½"-2½"-4"-6"-8"

HOVIS UNIVERSAL COMPOUND DIES

for producing WASHERS and SMALL STAMPINGS . . . No need to make a NEW DIE for every STAMPED PART

By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

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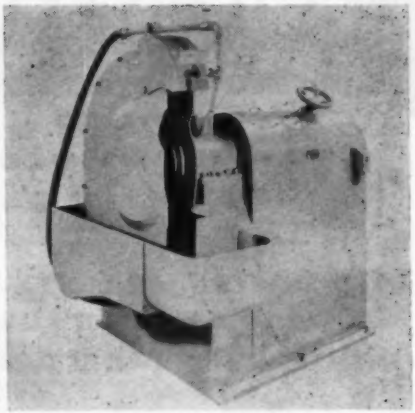
Phone: Slocum 7-4800 Suburb of Detroit

Adjustable Speed Wet Grinder

Model 61 AVSW adjustable speed wet grinder sharpens form dies which are used in blanking out innumerable shapes in fiberboard, draft, plastics, foil, paper and other packaging materials in many industries. A 36" x 4" wheel offers almost a flat surface for grinding and is ideal for this purpose. It can also be used for grinding high speed tool bits such as in well drilling, mining and tool shops of various types.



Sharpens form dies; grinds high speed tool bits.

Up to 20 hp for 36" x 4" wheel can be furnished.

The grinder is reported to provide constant peripheral speed which results in longer wheel life. It is available with a coolant pump for wet grinding. Maximum peripheral speed

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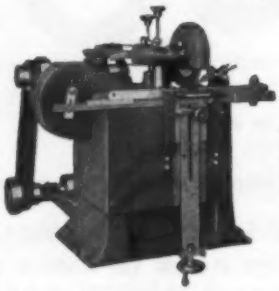

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- Articulate arm swings clear of large table for placement of work.
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- Vise holds work as small as 5/8" square.
- Floating tap locates itself in hole.
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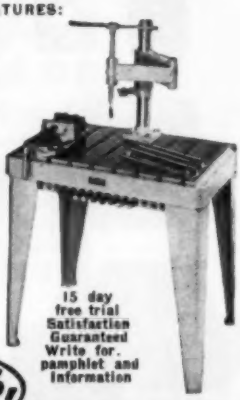

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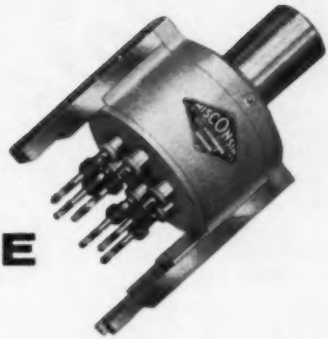


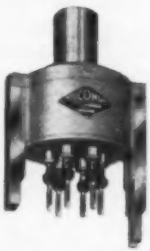
Wisconsin Rotating Heads — designed and built to fit all types of lathes and chucking machines.

Adjustable Multiple Spindle Drill Heads — double eccentric for irregular hole spacing.

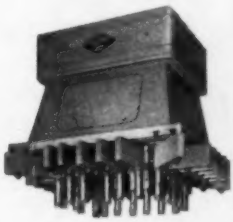
The highly efficient, low-cost performance of these modern rotating heads on automatic chucking machines and lathes has been proved in a variety of drilling and tapping operations.

The experienced counsel and technical assistance of the Wisconsin engineering staff is available to you on your drilling and tapping operations. Write today.

Fixed Spindle Drill Heads — engineered to your specifications.



Rotating Multiple Spindle Tapping Heads — for turret lathe or chucking machine.



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Convertible Type Drill Heads — engineered for high productivity.

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for either vitrified or high speed grinding wheels is said to be maintained for the entire life of the wheel. Adjustable wheel guard and speed changer are interlocked in to prevent overspeeding of the grinding wheels.

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An all plastic bearing has been developed for use on electrical devices, material handling equipment, etc. The important feature of these Roll-Dri bearings is that they can be run dry, without benefit of any lubricant.

The manufacturer also states that the extremely low coefficient of bearing surface friction and the material's ability to withstand frictional heat eliminates danger of bearing failure where heavy loads tend to squeeze oil out of the bearing surface.

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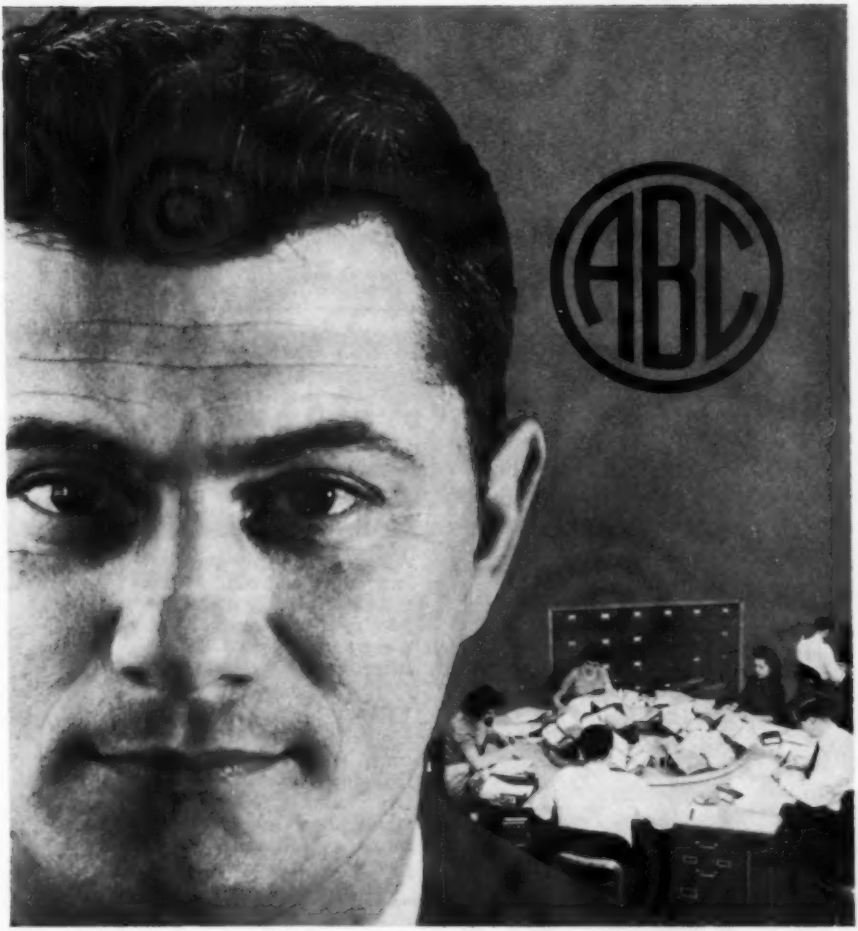

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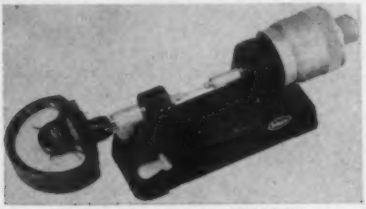
Indicator Bench Micrometer



Micrometer reads to .000020".

The new Mahr Super-Comparator bench micrometer, designed for measuring small delicate parts, has a range from 0-1" and indicator reading directly in 20 millionths of an inch. It employs a non-rotating spindle. The thimble diameter of the micrometer is 1¾", throat depth, 1.280". 11 different types of measuring anvils are offered, which are interchanged readily without need for adjustment. The unit also serves as a comparator and can be set without additional standards.

Mahr Gage Co., Inc., New York City.

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MARK II
Shoplifter

New Low Price $195.00 *
New Capacity Full 750 lbs.

All lifters at this price *are not* the same. Compare and note the quality of the new Mark II, which now replaces the Type D Shoplifter. Full 750 lb. capacity can be handled safely anywhere on the platform.

No-drift, full control hoist unit. Raise or lower the load to fractional positioning. Built for years of continuous service with minimum maintenance. *Complete* safety features included at no extra cost.

Applicable in small plants for "too heavy to lift loads" and in large plants to supplement powered equipment. The economical way to transfer molds and dies, unload trucks, stack in narrow aisles, or raise parts and machinery to working levels.

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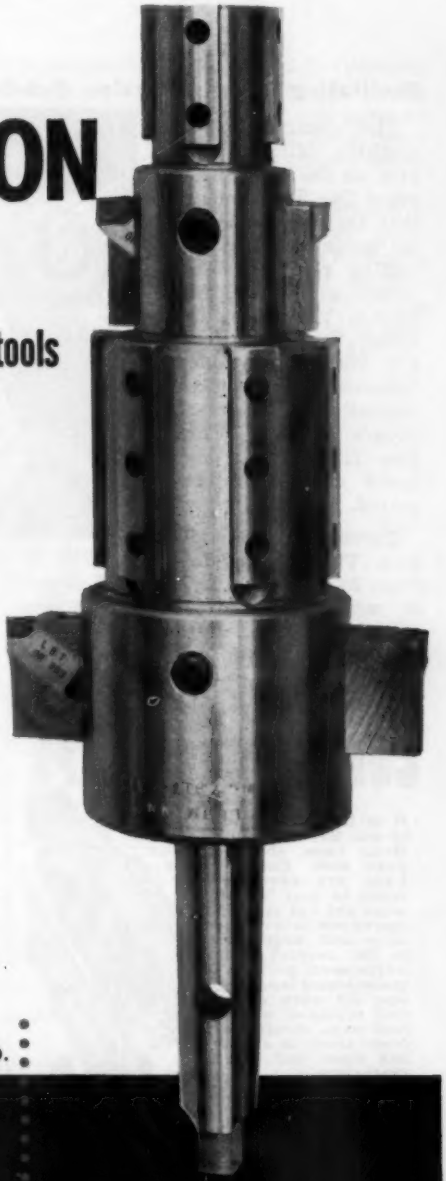

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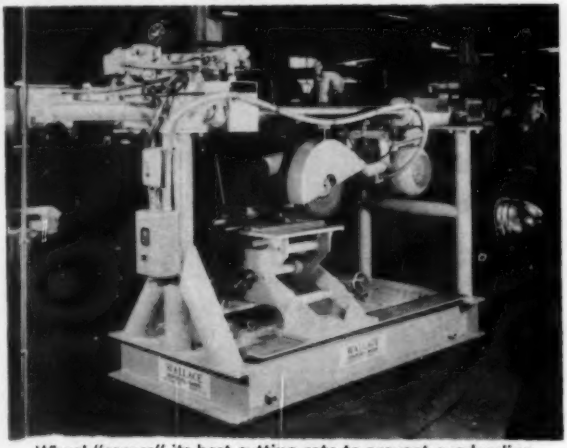
Oscillating Type Abrasive Cut-Off Machine

The abrasive cut-off machine offered operates on the principle of other See-Saw units in that the wheel's ability to "sense" its own best cutting rate prevents overloading the machine, the company states. Traverse feeds are vernier controlled. Traverse movements are controlled by an on-off thumb switch. Very fine finish and high speed cutting are reported.



Wheel "senses" its best cutting rate to prevent overloading.

Three sizes are available. They are as follows: 20" wheel, 15 hp, dry, 24" stroke; 26" wheel, 20 hp, dry, 30" stroke, and 34" wheel, 40 hp, wet only, 36" stroke. The 20" unit can cut shapes which equal a 24"x6" I-beam. The 26" unit can cut shapes which equal 30"x8" I-beam. The 34" unit can cut shapes which equal 36" x 12" I-beam. Plates

Boyar-Schultz

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(STANDARD and EXPANSION)

It is less costly and quicker to use Boyar-Schultz Copper Head Laps, than to make your own. Copper Head Laps are accurate and rapid to use. Nothing to wear out but the copper sleeve which is replaceable and adjustable to the correct size. Adjustment permits maintaining lapping size till worn out and replaced with new ones. Available from stock in standard sizes, ¼" to 2½" diameters.

SPECIAL TOOL MAKERS BENCH LAP SET

Consists of seven most commonly used sizes — 1/8"-3/16" ¼" - 5/16" - ⅜" 7/16" - ½", with enameled die cast base.

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PIONEERS and PACEMAKERS in their line

head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—sizes to meet all needs—types include Vertical and Horizontal Multiple Spindle.

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and other metal sections can also be cut.

Other than standard stroke lengths can be supplied.

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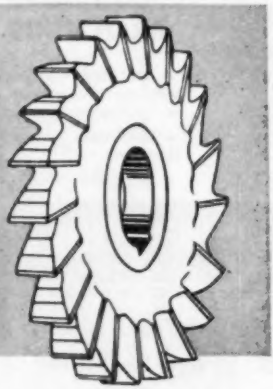
The Weingarten percussion screw presses, introduced by Cosa Corp., form ferrous and non-ferrous materials, hot or cold. They are available in many sizes, from 80 to 3000 tons pressure. Featured are the infinitely variable stroke and infinitely variable pressure, which are easily set over a wide range by dials and scales. Two hand operating controls provide maximum operator safety.

The drive mechanism produces a sharp, elastic blow at the tool stage, and provides quick, automatic reversing of the ram by motor reversal. The flywheel is driven directly by a friction roller or, on larger presses, by a gear and gear-ring assembly flexibly con-

Better Tools From SENTRY Hardening



THE TRUE TEST of your machine tools is their performance on the job — how they benefit your production. This is where Sentry Furnaces with the Diamond Block method of atmosphere control demonstrate their value. Your high speed steel tools hardened in the truly neutral Sentry Diamond Block atmosphere achieve maximum hardness without scale or decarburization, maintain their sharp cutting edges longer, step up production.

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SEND FOR THIS FREE INFORMATIVE GARLAND BROCHURE

- Split-Head Hammer with interchangeable nylon or rawhide faces.
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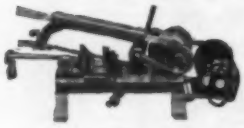
Cut Cutting Costs with KELLER Power Hacksaws

5 Sizes - 10 Models at 1955 PRICES



JEFFERSON "601"
4" x 4"
Complete with motor & switch, wired, ready-to-go.
ONLY $79

No. 5 HY-DUTY
10½" x 9"
A rugged, versatile saw with 1 or 3 ph motor & switch wired.
$705.00
F.O.B. Factory.

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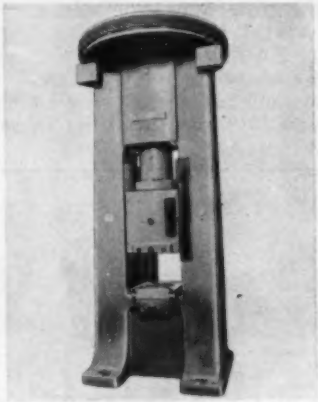
nected to the flywheel. Compressed-air brakes enable the ram to be stopped and held in any position.

Long guideways give maximum protection to tools even in "off-center loading" position.



80-3,000 ton pressure models offered.

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2- and 3-dimensional PANTOGRAPH ENGRAVERS

For general engraving—marking—profiling—die and mold milling

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A double handle torque wrench is said to be excellent for use in confined spaces as less than ¾" rotary travel gives a total torque range of 100 ft. lb. The tool torques both left and right. Over-all length is 20". The dial indicator has a range of ± 0 to 100 ft. lb. with a minimum graduation equal to 5 ft. lb. Smaller grads are available upon request.

A larger size torque tool, Model TDF-600, for heavy-duty torquing, is also

Model TDF-100 torques both left and right.

available. This has a range of ± 0 to 600 ft. lb.

Apco Mossberg Co., Attleboro, Mass.

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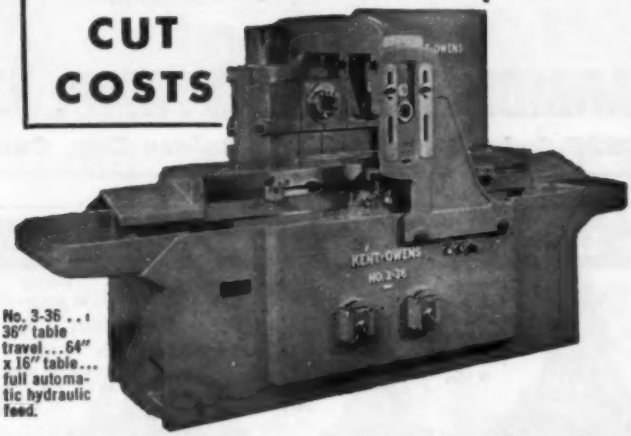

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Operators like 'em . . . because Kent-Owens Machines are extremely simple and practical. Turn out milling jobs *fast,* with minimum worker fatigue! Twin-post head mounting assures balanced load. Only two gear contacts, motor to cutter, for greater cutting efficiency. Write for bulletins on wide range of single and double spindle hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, Ohio.

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for MILLING MACHINES

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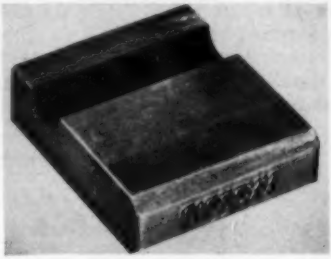
250,000 IMPRESSIONS

This stamp, manufactured by CARBIDE DIE & STAMP, INC., produced over 250,000 impressions on Hi Carbon, Hi Chrome tool steel for Zephyr Mfg. Co., of Inglewood, California, prominent tool manufacturers. . . . .

A 100% INCREASE OVER THEIR PREVIOUS STAMP.

(Trial order to rated companies—send your purchase order.)



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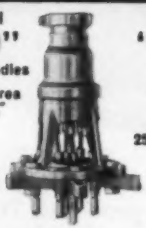
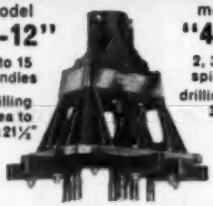
For LOW COST Hole Production

model "900"
2 to 8 spindles
drilling area to 22¼"

model "500"
2 to 6 spindles
drilling area to 18⅛"



model "8-12"
2 to 15 spindles
drilling area to 25½" x 21½"



model "400"
2, 3 or 4 spindles
drilling area 3¾"

model "3-22"

2 to 15 spindles — drilling area to 35½"

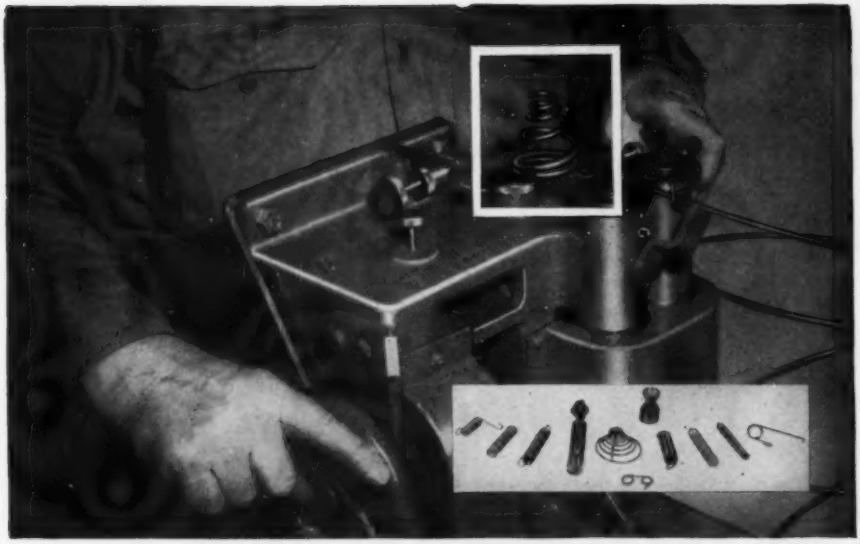
Pick a MULTI-DRILL to Fit the Job

Commander MULTI-DRILLS — adjustable multiple spindle drill press attachments—are sold and serviced by a nation-wide network of Commander Distributors—experienced, helpful specialists in solving drilling and tapping problems. Write for the name of your nearest Distributor and the complete Commander Production Tool Catalog which contains full details on every MULTI-DRILL and many other production drilling and tapping tools.

104

Commander MFG. CO. 4227 WEST KINZIE STREET CHICAGO 24, ILLINOIS

Use postpaid card. Circle No. 389



Any spring made fast in your shop!

WITHOUT USE OF ARBORS

For a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005″ to .125″, you can produce it in a matter of seconds with Perkins Precision Spring Coiler. You eliminate arbors, yet turn out precision springs — torsion, compression, extension, tapered, or special springs, coiled either left or right hand, in any desired length, any diameter from 3/32″ to 12″ and larger, with or without initial tension, and with open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications as replacements or experimental work. Make them fast, right in your own shop!

PERKINS
MACHINE AND GEAR CO.
Special Machinery Division,
West Springfield, Mass.

Starrett adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.

Perkins Machine and Gear Co.
Special Machinery Division, Dept. A-2
W. Springfield, Mass.
Please send information and prices on Perkins Spring Coiler.
Hand Model ☐ Power Model ☐

Name.....Title.....

Company.....

Address.....

City.....State.....

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Belt Grinding Attachment For Angle/Straight Wheel Grinders

Attachment and handle adapter for angle type grinder.

The new Nedco belt grinding attachment is available for both angle and straight wheel type portable grinders of any make powered by either air or electricity. It is ideal for grinding all contours and helpful where a straight-line finish is desired. A quick-change belt is featured.

The attachment is supplied with three 2"x20" abrasive belts. When it is to be fitted to an angle grinder, an adapter for the side handle is also supplied.

Nedco Co., Waltham, Mass.

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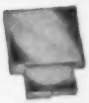

48-Hour Delivery* of Tooling for *Special Internal Forming*

for Brown & Sharpe and other makes of Automatic Screw Machines

Send for this FREE SAMPLER KIT

See how these radial relief tools are ground, why they are so free cutting, how they produce quality parts (non-ferrous or steel) at very low cost. Prove in your own way, at your convenience, just what B & W has to offer.

Just mail this ad clipped to your letterhead, sign and we'll send the Sampler Kit to your personal attention. No obligation and return postage is enclosed in case. Tooling retained will be billed after case is returned.

*with overtime

B & W PRECISION PRODUCTS CO.

11393 E. Eight Mile Road, P.O. Box 3865

Detroit 5, Michigan, Engineering Dep't. M

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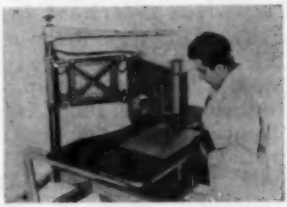
Torch Cutting Duplicating Machine

A new, simple-to-operate torch cutting duplicating machine, for single or batch cuts, uses four methods of operation: (1) cutting to sheet-metal templates; (2) cutting direct from drawing; (3) circular cutting, and (4) straight cuts in the desired direction.

The machine is used for cutting any shaped sections from iron plate .118" to 4" thick. The manufacturer reports that much set-up time is saved since it uses existing drawings, templates or automatic attachments.

Milo Manufacturing Co., Elizabeth, New Jersey.



Cuts .118" to 4" thick plate.

Use postpaid card. Circle No. 115

Six machines protected from dust by Torit for **$666.15**

This Torit Dust Collector, Model 219FM, complete with accessories, was installed by the Mohr Lino Saw Co., Skokie, Ill., to protect 3 belt sanders and 3 other grinders (2 grinders hidden from view) from destructive dust—at a total cost of just $666.15!

After one year's operation, Mohr Lino Saw says this about their *low-cost* Torit installation: "The Torit installation has kept our shop *cleaner*, our operators *happy*, and *protected vital* machinery."

You too can achieve greater machine protection and cleaner working conditions by trapping dangerous or valuable dust *at its source* with a completely *self contained* and *portable* Torit Dust Collector. For full details write to:

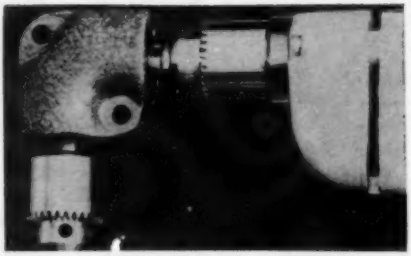
TORIT MANUFACTURING CO.
Dept. 603 1133 Rankin St., St. Paul 16, Minn.

Use postpaid card. Circle No. 392

Heavy-Duty Angle Drive Will Not Overheat in Operation

The ABL angle drive is said to have the heavy-duty bearing structure needed for in-plant production use without over-heating. This is possible because the bearing structure has ball races ground in the end of hardened gears to provide both thrust and radial stability.

Performance specifications include transmission in a 1-to-1 ratio of 1-1/3 hp at 3,000 rpm's or 1/3 hp at 750



Tool can be used with air drills or flexible shafts, or with standard 1/4", 5/16" and 3/8" electric drills.

DO YOU WANT FAST, ACCURATE SCRATCH-FREE BENDS?

Dan Smith, Shop Supt. at Columbus Stamping and Mfg. Co., Columbus, Ohio, says: "Bends fast . . . never scratches prepainted tubing . . . no maintenance in three years."

FAST, VERSATILE MODEL 1400 BENDS TUBING, BARS, PIPE, ANGLES, CHANNELS, ROLLED SHAPES OR EXTRUDED PARTS

- **SAVES TIME, CUTS COSTS** — on production, experimental, maintenance or small lot bending jobs.
- **ELIMINATES WORKPIECE INTERFERENCE**—on jobs with multiple planes, odd shapes. Pivoting top assembly and double tool holder ways on arms permits two-minute change from right-hand to left-hand bending.
- **ACCURATE HYDRAULIC POWER**—with convenient controls bends consistently to ± ½° tolerance.
- **PRODUCTION CAPACITY**—smooth, low-cost bends at speeds of 300 to 400 an hour; material up to 1¼" O.D. tubing.

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PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery — 690 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

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NEW!
NEW!
NEW!

now available!

CLEMSON STAR Copper Tang QUALITY FILES...

Newest addition to the fast growing CLEMSON STAR line!

Pick up a "Copper Tang" File and examine it closely. One look will tell you that this is a product of precision workmanship. **Test it** in a difficult application. You'll discover how scientific heat treatment has toughened the edges to make cutting easier and faster. **Scrutinize it** for defects. You won't find any. We inspect and test each file **individually** before releasing it from the factory. **Check** CLEMSON's complete line of quality files to discover for yourself how they're better built for better performance.

Contact your local CLEMSON STAR authorized Distributor. He'll furnish you with detailed information on new "Copper Tang" Files. And fill your other cutting tool needs as well. Call him today.

STAR files are a Clemson product.

2910

CLEMSON STAR

CLEMSON BROS., INC. • Middletown, N. Y.
METAL CUTTING PRODUCTS

POWER HACK SAW BLADES • HAND HACK SAW BLADES • HACK SAW FRAMES
BAND SAW BLADES • HOLE SAW BLADES • FILES • CLEMSON HAND MOWERS

Use postpaid card. Circle No. 394

rpm's, and a maximum allowable speed of 6,000 rpm's with standard lubrication. It can be used with air drills or flexible shafts, or with standard ¼", 5/16" and 3/8" electric drills. Works well in extremely limited spaces.

Tool dimensions are 2¼" approx. for the casting only, and 4¼" over-all including chuck.

Price & Rutzebeck, Hayward, Calif.

Use postpaid card. Circle No. 116

Stainless Steel Gage Blocks

These new stainless steel gage blocks are said to be the most perfectly surfaced blocks ever produced. Surfaces are 68 to 70 Rockwell C. The manufacturer, The DoAll Co., states the gage blocks' fine optical finish denotes the extreme hardness and density of the gaging faces.

Other advantages reported are corrosion resistance, stability, and sufficient coefficient of expansion.

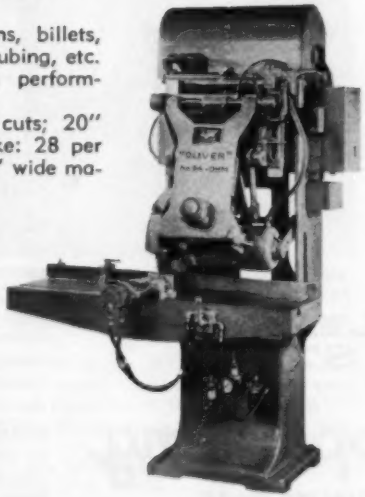
The surface finish of these new stain-

"OLIVER" No. 94-DHM HYDRAULIC CUT-OFF SAW

Cuts nonferrous metals without burr and at a high rate of production

For aluminum extrusions, billets, copper and brass bars, tubing, etc. Designed for precision performance.
Saw: 14" std. for 3" cuts; 20" max. for 6" cuts. Stroke: 28 per minute maximum for 6" wide material. Table is cast iron 15" x 48" with aluminum throat plate and opening with chute for automatic removal of pieces up to 6" long.

Write for full technical details.



OLIVER MACHINERY COMPANY
GRAND RAPIDS 2, MICHIGAN

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NEW

AN EXCEPTIONAL DEVELOPMENT IN THE COMPOUNDING OF RUBBER CUSHIONED ABRASIVES

Semi-Firm Binder Brightboy GB

The addition of the Semi-Firm GB Binder to the Brightboy line introduces new, time-saving rubber-cushioned abrasive compounds of inimitable formulation and unusual versatility.

GB rounds out the Brightboy line—the only complete, comprehensive STOCK LINE of multi-use rubber-bonded abrasives. Wheels, sticks, rods and blocks for machine and manual operations bring a wide, revolutionary concept to finishing—work saving applications not previously associated with abrasive uses.

With the introduction of the new Semi-Firm GB Binder, the Brightboy line now consists of FOUR BASIC RUBBER-CUSHIONED BINDER GROUPS: ST, Soft, GB, Semi-Firm; BL, Firm; TT, Tough. New GB combines the advantages of the Soft ST Binder with the durability of the Firm BL. *Each* of these four basic groups is made in an extensive range of Aluminum Oxide and Silicon Carbide abrasive grains. An additional binder, Fins-Tex, is compounded with pumice abrasive. All are available from STOCK. You may have employed other methods or products in an endeavor to obtain the results which can now be achieved by new Semi-Firm Binder GB or other Brightboy Abrasives. Benefit from the new GB Binder—or the other Brightboy Binders. All JOB-MATCHED to your production in speeds and strength.

WRITE TODAY FOR

- LIST OF JOB-MATCHED BRIGHTBOY GRAINS AND TEXTURES
- APPLICATIONS, MACHINE SPEEDS
- SAMPLE HAND TABLET
- NEAREST DISTRIBUTOR'S NAME

WELDON ROBERTS Brightboy RUBBER CUSHIONED ABRASIVES

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th Street Newark 7, N.J.

America's Pioneer Manufacturer of Rubber-Bonded Abrasives

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Strand

FLEXIBLE SHAFTS

FLEXIBLE SHAFT MACHINES . . .

- Grinding
- Rotary Filing
- Wire Brushing
- Buffing
- Polishing
- Remote Power Drives
- Remote Controls

The complete flexible shaft machine line with horsepowers from ¼ to 3, with wide range of speeds, shaft sizes; tripod floor mountings, bench or vertical models available for every operation.

Send for literature!

N. A. STRAND
FLEXIBLE SHAFT, INC.
601 S. Washtenaw Ave. Chicago 12, Illinois

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Surface hardness of 68 to 70 Rockwell C.

less steel blocks, exceeding even the .09AA finish of DoAll regular steel blocks, is said to result in greater accuracy and longer life.

The DoAll Co., Des Plaines, Ill.

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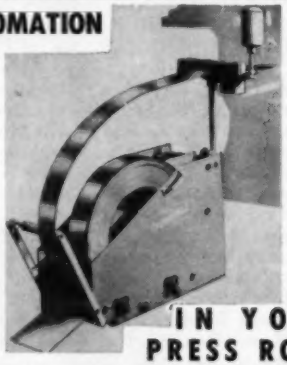
High Production Drilling Unit

First of a new line of hydraulically actuated units to be introduced by the John S. Barnes Corp. is the E.J.S.

AUTOMATION



IN YOUR PRESS ROOM

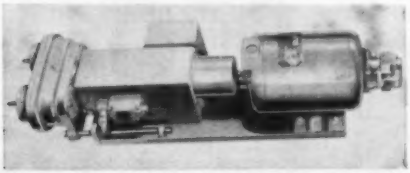
Automation for your press room is easily achieved through use of a "Powerell" Coil Cradle-"Clean-Oiler" combination, a press equipped with an automatic feed and a die having a built-in scrap chopper, to form a completely automatic high production machine. Get maximum production by using this compact cradle-oiler unit. It can easily be moved from one press to another as needed, and can be loaded without a crane. Prices start at $325.00. Capacities available to 24" width, to 54" O.D., and to 4,000 lb. weight.

Write for Literature

THE MEDELTON CO., INC.
335 E. 142nd St. Bronx 54, N.Y.

Use postpaid card. Circle No. 398

Junior. Some of the advantages listed include: 600 lb. thrust, 4" maximum stroke, 0-3000 cycles per hour, and spindle speeds 1200 rpm and up. It can be furnished as a single spindle unit or with multiple spindle head.



This unit has 600 lb. thrust, 2000 rpm spindle speed.

Illustrated is one of the initial prototypes, with a two spindle drill head, which was tested by continuous production for over three years. The unit is powered by a ½ hp, 1800 rpm motor. Thrust capacity of 600 lb. and spindle speed of 2000 rpm are offered. It has a cycle time of two seconds for a 3" forward and return stroke.

John S. Barnes Corp., Rockford, Ill.

Use postpaid card. Circle No. 118

FREE WALL CHART
MARSHALL
Ground Flat Stock
SPECIAL SIZES FURNISHED ON REQUEST—SPECIFY MARSHALL PREPARED TOOL STEELS
COMPETITION
BRINGS OUT THE BEST IN EVERY COMPANY
MARSHALL STEEL COMPANY specializes in the production of Ground flat tool steel, Drill Rod and allied products. Since 1945 Marshall Steel Co., has grown to FIRST PLACE in the production of velvet finish ground flat tool steels.
DID YOU KNOW THAT...
Marshall was FIRST to produce wide sizes.
First to produce thicknesses over ½ inch.
FIRST to offer long lengths from stock for economy.
FIRST to furnish 5% chrome Air Hardening steel in finished ground form.
FIRST to supply 5% chrome AIRcraft Hardening tool steel in both 18" and 36" lengths.
FIRST to manufacture LOW CARBON 1018 steel for applications not requiring hardening.
FIRST to safety wrap in Aluminum Lined rustproof wrappings.
LEADERSHIP—often copied—never equaled!
This is why—Marshall Steel Company has grown to be the largest producer of Ground Flat Tool Steel.
FOR YOUR CONVENIENCE write for colorful wall chart with all sizes and grades.
We invite comparison—write for complete catalog of products.
Em-blem of Excellence
MARSHALL STEEL COMPANY
Box 10888, LaGrange, Illinois

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Specialized TOOLS

that Rate a Place in your Tool Crib

The cost of Walton *Specialized* Tools is negligible compared with the labor and time cost that they save. A Walton Tool readily at hand is insurance against lost time. Try them at our expense in your shop . . . and rate them for a place in your tool crib.

Write for Data *Folder No. 12*

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THE WALTON COMPANY HARTFORD 10 CONNECTICUT

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THE BEST PORTABLE ELEVATING TABLE YOU CAN BUY . . .

(Eliminates Cranking)

2000 LBS. OR *1000 LBS. CAPACITIES ILLUSTRATED

A precision made MIDWEST TABLE Costs no more!

- It's hydraulic . . . positions work or feeds at desired height without use of hands
- Rigid cast construction
- Top turns 360° and clamps
- Foot release valve to lower
- Machined top surface can be used as work table
- Roller bearing casters with ball bearing swivels
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Write today . . . specials on request

MIDWEST

[illegible] MACHINE COMPANY

312 WEBSTER ST., DAYTON 2, OHIO

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they're new! VICTOR Yellow Tang quality files...

Latest Addition to the big VICTOR Line

What do **you** look for in a new product? Precision workmanship? Improved performance? Guaranteed dependability? An established brand name? You'll find all four in new VICTOR "YELLOW TANG" Files.

Individually checked and tested before they leave the factory, new "YELLOW TANG" quality files are the latest addition to the fast growing line of outstanding VICTOR metal cutting tools.

Your local authorized VICTOR distributor will gladly furnish you with detailed information on new "YELLOW TANG" Files. Contact him today. He's ideally equipped to fill **all** your cutting tool needs.

VICTOR

VICTOR Saw Works, Inc.
METAL CUTTING PRODUCTS
Middletown, N. Y.

POWER HACK SAW BLADES
HAND HACK SAW BLADES
HACK SAW FRAMES
BAND SAW BLADES
HOLE SAW BLADES
FILES

© 1959

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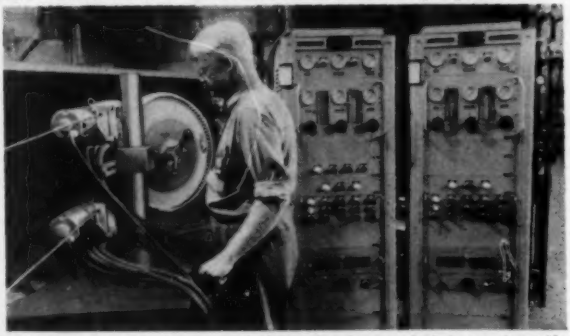
Metallizing Machine Has Electronic Remote Control Equipment

The Metco Type K electronic control-electric drive metallizing machine is designed for high speed automatic operation in production, production salvage, or heavy maintenance work. It is well suited for use as an individual unit or as a built-in part of a complete automation set-up for large scale production. The electric drive provides quiet operation; dynamic braking is afforded at high speed, and a wide speed range is offered to 40 fpm. The machine handles all sizes of metallizing wire up to 3/16" dia.



Jet engine seal rings are being aluminum clad by automatic production metallizing. Work is done in plant of major aircraft engine manufacturer for purpose of corrosion protection. Two Type K metallizing machines on the left are operated by Type C electronic control panels at the right.

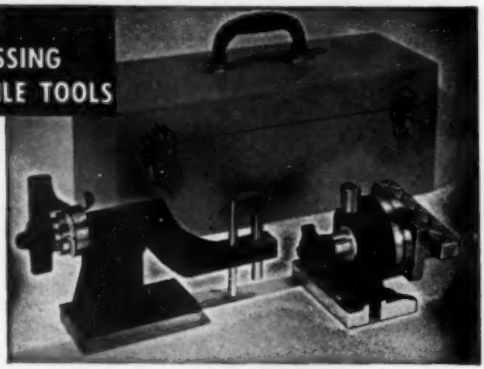
This machine is driven by a high capacity electric motor, monitored by an electronic speed control system which permits adjustment of wire speeds throughout the entire usable range. Once adjusted, wire speed is held constant regardless of fluctuations in load

Now ANGLE TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

MIGHTY GOOD AT ANY PRICE BUT TOPS AT ONLY $149.50

(Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.



Our fixtures will dress most radii and angles tangent to each other, similar to those shown below.

FREE handsome, wooden storage box. Write for complete information.

Distributorship available in select territories.

ROTHFUSS TOOL COMPANY

BOX 2694, ELMWOOD STATION PROVIDENCE 7, R. I.

Use postpaid card. Circle No. 403

and operating conditions by an electronic control unit.

The control panel provides automatic operation. A "fail safe" operation is provided which automatically shuts down the gun in the event of interruption of air, oxygen or fuel gas.

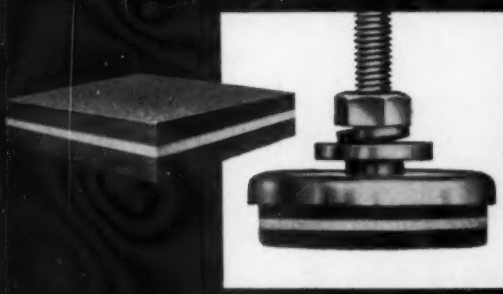
Metallizing Engineering Co., Inc., Westbury, L.I., N.Y.

Use postpaid card. Circle No. 119

ROTARY INDEX TABLES. A new line features a slow start and a slow stop on each index. There is a choice of a fractional hp electric motor, rotary air motor, or hydraulic motor for power. Locking and indexing is entirely mechanical. Available with 10" or 18" dia. table top and choice of station requirements. Jackson Fluid Power Co., Detroit.

Use postpaid card. Circle No. 120

How to Control
VIBRATION



Unisorb pads and Leveling Mounts reduce up to 85% of transmitted vibration and noise! Effective on everything from light laboratory equipment to giant machines.

- Complete selection of types for precision mounting, various loadings and machine lengths.
- Works two ways: Prevents external vibration from affecting equipment; Reduces machinery-generated vibration from being transmitted to floor.
- Allows higher driving frequencies, faster machine operation.
- High friction coefficient prevents "walking," cement available for extreme reciprocal thrusts.

Unisorb can be used by itself or incorporated into special-purpose mounts or machine designs. Send for new Unisorb Bulletin and details on Money-Back Trial Offer, NOW.

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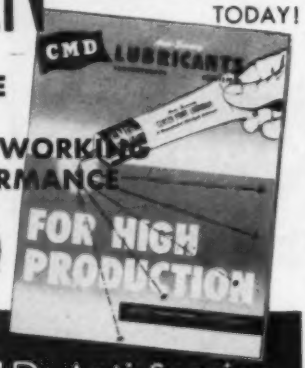
PRODUCTION MEN

send for this **FREE BROCHURE** TODAY!

INSURE TOP METALWORKING PERFORMANCE



CMD Anti-Scoring
LUBRICANT
HIGH PRESSURE NON-SEIZING

Increase your production with fewer rejects and longer runs. Users report savings up to 81% over conventional lubricants.

Cams	Thrust bearings	Grinding centers
Gear cutting	Broaching	Milling machines
Gear grinding	Die set posts	Screw machines
Machine ways	Deep drawing	Rivet spinning
Steady rest	Bandsaw guides	Screws and nuts
Swaging	Tapping	Wire drawing
Flo-turning	Lathe centers	Lead screws
Pilot bars	Anti-friction bearings	Stamping
Heavy journals	Extruding	Press fits
Speed reducers	Plug gages	Thread gages
Ring gages		

CHICAGO MANUFACTURING & DISTRIBUTING CO.

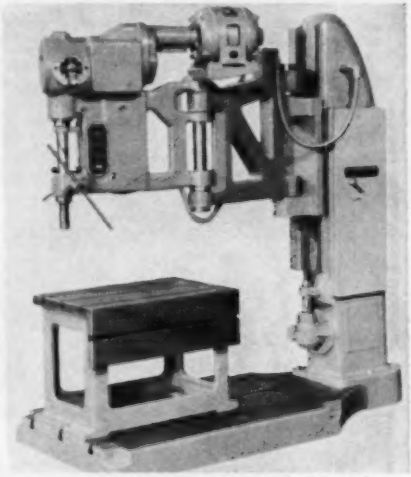
1906 West 46th St., Chicago 9, Illinois

Use postpaid card. Circle No. 405

Improved Drilling Machine Features New Electrical System

Embodying a number of improvements over earlier models, the new Type G Footburt-Hammond sensitive radial drilling machine incorporates a completely new electrical system. The push-button station is located at the drill head and the main electrical enclosure is set into the machine column. A jointed arm permits ready placement of the head in relation to the work.

The machines are ideal for drilling,



For machine repair, tool and die work.

tapping, reaming and similar operations on any large work, such as machine repair, tool and die work, or others requiring a number of holes spread over a large area.

The fully counterweighted spindle is provided with hand feed and a six-speed drive. Vertical adjustment of the saddle is 24"; spindle travel is 7"; spindle can be moved in a radius from 15" to 50" away from the saddle trunnions. On a 60-cycle installation, spindle speeds are from 95 to 1140 rpm; capacities are 1⅛" drill, 1" tap in cast iron, 1" drill, ⅞" tap in steel.

The Foote-Burt Co., Cleveland, Ohio.

Use postpaid card. Circle No. 121

FOR THAT EXTRA EDGE IN PRODUCTION!

3½ TIMES MORE END MILL PRODUCTION with the New B&S Thriftmill® in Competitive Shop Tests!

20% Lower Initial Cost, Superior Microfinish and Less Downtime also Proved using new B&S Thriftmill.®

TEST DATA

MATERIAL:

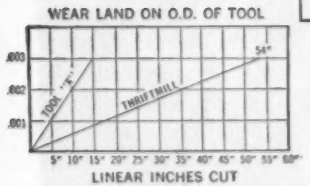
MATERIAL: A1S1-D3 oil hardening tool steel. Hardness, Rockwell C-18.

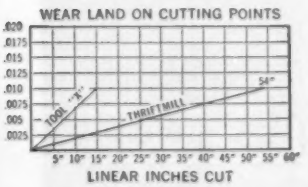
BOTH END MILLS

½" Dia., 4 flute.

CUTTING DATA

	RPM	SFM	CHIP LOAD	TABLE FEED	DEPTH CUT	WIDTH CUT	LENGTH CUT
B&S Thriftmill®	325	43	.00125	1⅛"	¼"	½"	54"
BRAND "X" End Mill	325	43	.00125	1⅛"	¼"	½"	15"





MICROFINISH AFTER TESTS

B&S Thriftmill, bottom of slots, RMS 35.
B&S Thriftmill, sides of slots, RMS 30-38.
BRAND "X" End Mill, bottom of slots, RMS 70-100.
BRAND "X" End Mill, sides of slots, RMS 40-60.

The initial economy of the new B&S Thriftmill, together with the proven production benefits engineered into this fine tool, gives a competitive advantage to all B&S Thriftmill users.

There are 1065 different "standard" off-the-shelf B&S end mills to choose from. End wonder, worry and wait—take advantage of B&S tooling superiority and speedy service—call your B&S Distributor now.

Send for "Condensalog" to: Cutting Tool Division, Brown & Sharpe Mfg., Co., Providence 1, R. I.

Brown & Sharpe
HIGH SPEED STEEL CUTTING TOOLS

NELCO
CARBIDE CUTTING TOOLS

SPELLMACO "SPOTTERS"

A matched set of transfer punches for toolmakers, machinists & tool cribs

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel—Carefully heat treated and tempered for long life—0025 undersize to facilitate use—Black oxide finish

Set No. 3-17, 28 punches with indexed stand—sizes 3/32" to ½", by 1/64"—plus handy 17/32" size. Length 4⅝" ONLY $17.90

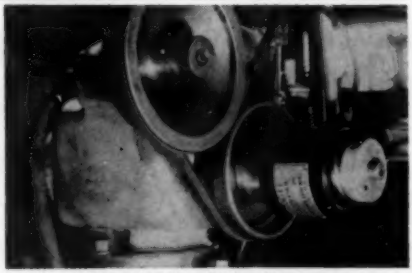
Single sizes available

R. L. SPELLMAN CO. - URBANA, OHIO

Use postpaid card. Circle No. 407

Collet Control Provides For Positive Control of Work

These units, designed for light duty on grinders, feature double acting cylinder with .125 stroke. The cylinder is non-rotating with "O" ring seals. Thrust load is absorbed by two sealed bearings. Closing pressure on the workpiece is constant and adjustable when controlled with pressure regulator. Method for mounting is said to provide an absolute minimum of radial run-out.



Model SD has ½" collet cap.

POWER

. . . when you need power!

1½-75 TONS

GREENERD, for 76 years, has manufactured Power-Performing ARBOR and HYDRAULIC PRESSES; maintenance-free; may be furnished to J.I.C. Standards, and designed to handle the following variety of work:

- ASSEMBLING
- BENDING
- BROACHING
- BURNISHING
- CRIMPING
- EMBOSSING
- FORMING
- MOLDING
- RIVETING
- SIZING
- STAKING
- STRAIGHTENING

Write for Catalogue #656

Greenerd ARBOR PRESS CO.

41 CROWN ST. NASHUA, N.H.

Use postpaid card. Circle No. 449

Model SD has ½" collet cap.; Model SDD has 1" and 1/16" collet cap.

Adams Equipment, Reseda, Calif.

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"No Bounce" Shot Loaded Hammer

The Metocraft Alloy & Plastic Co. of West Springfield, Mass., announces the addition of a new "no bounce" hammer to its product line of screw-on replaceable tip plastic hammers.

The aluminum head has two separate cavities which are permanently loaded with loose shot to completely eliminate rebound. The advantage reported is that the two separate shot-loaded cavities permit handle replacement, if necessary, without loss or spillage of the shot.

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OLIVER CORPORATION

"NEVER SATISFIED UNTIL

IT HAS THE BEST"

BUYS TUNGSTEN CARBIDE

ON PERFORMANCE...

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If you are interested in improved efficiency, economy, quality — let's hear from you . . . the coupon is for your convenience.

Producers of
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ADAMAS CARBIDE CORPORATION
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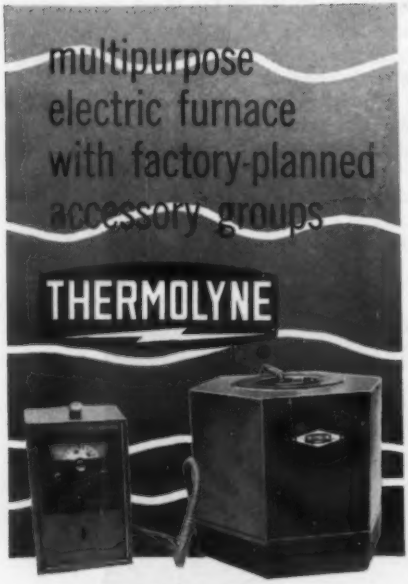


THERMOLYNE TYPE 2100

for small parts and short runs... top-loading... 6-5/8" dia., 11-1/2" deep chamber

With choice of six functional accessory groups, this one furnace lets you perform several distinct operations. Accessories make it adaptable as a salt bath, oil bath, melting, vertical muffle, or crucible furnace. Conversion from one operation to another is made quickly, easily, and safely, even when furnace is hot. Compact shape, triple insulation. Operating temperatures to 1650°F continuous, 1900°F intermittent. Automatic or semiautomatic controls available. Price of basic furnace without controls or accessories, $170. Accessory groups from $22.75. Write for literature and name of nearest dealer.

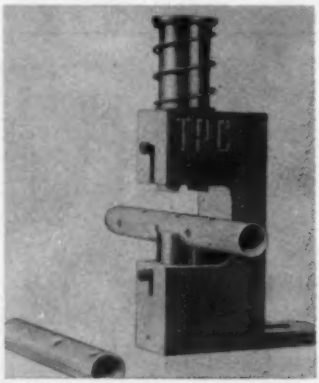
THERMO ELECTRIC MANUFACTURING CO.
486 Huff St., Dubuque, Iowa

Use postpaid card. Circle No. 409

Tube-Piercing Unit

A new tube-piercing unit is claimed to perforate one hole only or two opposed holes with one stroke of the press. The holes need not be the same diameter nor configuration and no mandrel is required. Distortion is reported held to an absolute minimum by the complete enclosure of the tubing during the perforating operation.

Multiple punching of a tube can be



achieved by arranging any number of these units in a press or press brake.

This unit is offered as a semi-standard product with component parts in stock ready to be machined to the specific tubing requirements of the customer. Variations are available for other extruded or rolled shapes.

Tool Products Corp., N. Tonawanda, New York.

Use postpaid card. Circle No. 125

New Ideas in Cutters

★ Designers and manufacturers of H. S. S., tantung, and carbide cutters based on cost saving principles. Form relieved, hard faced cutting edges, throwaway inserts, welded bodies, semi-finished blanks, clamped-on blades. Serving America's metal working, carbon, graphite, valve, and instrument manufacturers. **Write or phone LUdlow 8400 for latest catalog.**

NIAGARA CUTTER
Division of Bollier-Damerell, Inc.
336 Niagara St., Tonawanda, N. Y.

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A RUTHMAN

GUSHER Coolant Pumps

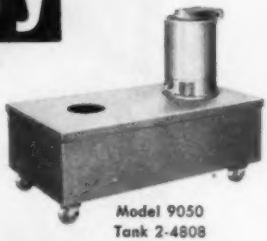
There is a type and model of Ruthman Gusher Coolant Pump to fit virtually every requirement; Immersed Type, Pipe Connected, Flange Mounted, and Shaft or Pulley Driven. Capacities from 1/30 to 7½ H.P.

Model UL

PUMP for every

GUSHER Tank Units

Gusher Tank Unit Coolant Pumps can either be mounted permanently on metal-cutting machines without built in coolant tank, or can be equipped with casters for complete portability. Capacities 1/30 to 7½ H.P.



Model 9050
Tank 2-4808

APPLICATION

RUMACO Seal Pump

Precision built, seal type Rumaco Pumps offer you the same advantages built into all Ruthman Pumps. Rumaco pumps are adaptable to a wide variety of applications. Capacities 1/10 to 7½ H.P.

Model 5-S

Turn to Ruthman for Any Centrifugal Pump Problem

Write for Catalog

THE Ruthman MACHINERY CO.

- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS

1816 READING ROAD CINCINNATI, OHIO

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Negative Rake Inserts Convert To Positive Rake Angles

A new grinding technique, converting negative rake throwaway carbide inserts to effective positive rake angles, is reported to result in approximately 50% savings over the cost of positive rake inserts. It is now possible to obtain all the technical advantages of positive rake angles with the economic advantages of negative rake inserts by utilizing all cutting edges of inserts.

The same toolholder can be used for both positive and negative rake inserts and the need of separate chipbreaker inserts is eliminated as positive chip control grooves are ground into the carbide insert.

Allied Tool Products Inc., Milwaukee.

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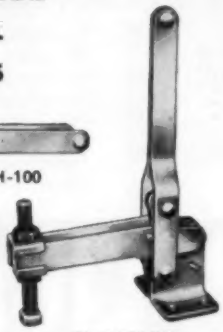
ELIMINATE BUGABOOS OF CORROSION AND MAGNETISM WITH KNU-VISE STAINLESS STEEL CLAMPS

Model PCH-100

Model H-200



Model V-200

All shown ¼ actual size

Knu-Vise stainless steel toggle clamps eliminate frustrating magnetic attraction and corrosion while spot welding, or while working near acids.

The complete stainless steel line contains 18 clamps with either horizontal, vertical, or T-style handles. There are types for side mounting and pull clamps as well. Write today for complete information. A standard or a special Knu-Vise clamp will probably be the answer to your application.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS — LAPEER MANUFACTURING CO.

3052 DAVISON ROAD
LAPEER, MICHIGAN

WESTERN DIV.: PECK and LEWIS CORPORATION
4436 Long Beach Ave., Los Angeles 58, Calif., ADams 3-7145

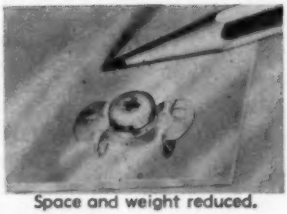
CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.
1131 Pettit Road, Burlington, Ontario

Use postpaid card. Circle No. 412

Miniature Quarter-Turn Fasteners

The new, miniature quarter-turn Lion fasteners have been designed for electronic, airborne and industrial units, saving weight and space. The receptacle measures .812" by .375" over-all, with .012" thickness. The retainer and stud are correspondingly proportioned. Six different stud lengths accommodate total material thickness (both sheets) of .040" minimum to .159" maximum. All the important advantages of the larger Lion fasteners (including the .020" grip range in each stud length) have been retained.

Southco Div., South Chester Corp., Lester, Pa.



Space and weight reduced.

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SUPREME

Use this unique steel for the very ultimate in cutting prowess. Highest hardness, highest wear resistance make **Vasco Supreme** the aristocrat of the shop when you want the most! Where production economics call for different bits, use **Neatro, Red Cut Superior, Red Cut Cobalt**—each a profit-maker in its range. *Write for Data Sheets.*

VANADIUM-ALLOYS STEEL COMPANY
LATROBE, PENNSYLVANIA

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Expanded Bed Presses Offer Increased Die Space

Using full press tonnage for die trimming is claimed possible by a new series of expanded bed Havir presses. They are now available in eight ton with 12"x12" bed; 12 ton with 12"x14" bed and 16 ton with 12"x14" bed.

The increased die space provided is said to make it possible in many cases to use a lower tonnage press than is usually required simply to obtain the necessary die space for die trimming operations.

Sales Service Mfg. Co., St. Paul, Minn.

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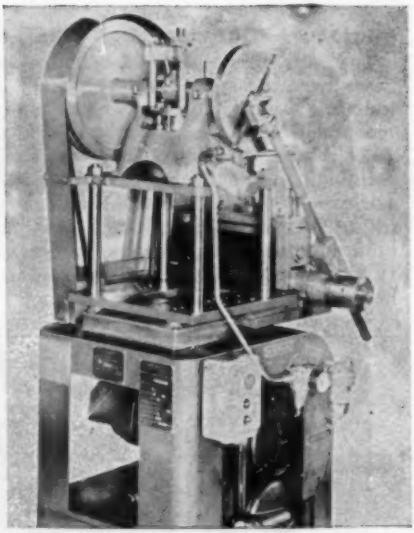
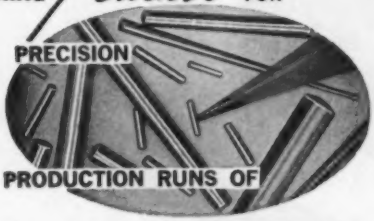


Uses full press tonnage for die trimming.

Radial Drill Press For Rapid Multiple Drilling

The new Delta radial drill press is designed to drill to the center, or any point, of a 32" square and is said to be ideal for rapid multiple drilling operations, horizontal drilling and angular drilling. The manufacturer also states the press is capable of performing accurate sanding, shaping, routing,

WRITE *Peaslee* FOR



TAPER PINS

DIAS. 9/0 to #4

As specialists in stainless-steel, instrument-type pins, we offer quantity runs of standard size Taper Pins. Tolerances are held to .001 on dia. Sizes run from #4 down to 9/0. Send your blueprints for prompt quotation.

THE PEASLEE METAL PRODUCTS INC.

470 Tolland St. • East Hartford 8, Conn.

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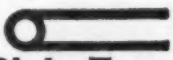
CLOSED

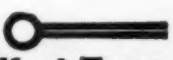
Plain Type



TRADE AUTOM MARK

CLOSED

Offset Type



CONTINUOUS HINGES

OPEN

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET

AUTO MOULDING & MFG. CO.

1110 E. 87TH ST.

CHICAGO 19, ILL.

SPECIFICATIONS

Open width 7/8" to 6"

Gage Material .040 to .125

Pin Diameter .101 to 3/8

Lengths to 120"

OPEN

SEMI-OFFSET

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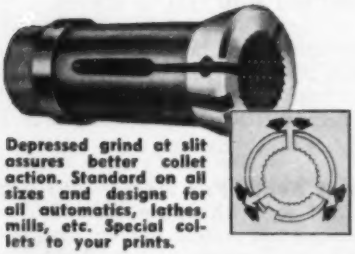
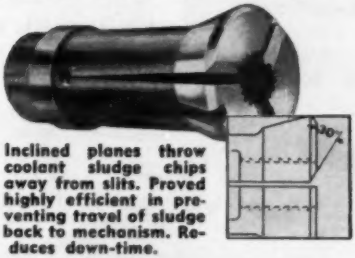
ALL SHEFFER STANDARD COLLETS HAVE SHEFFER CLOVER-LEAF GRIND



Depressed grind at slit assures better collet action. Standard on all sizes and designs for all automatics, lathes, mills, etc. Special collets to your prints.

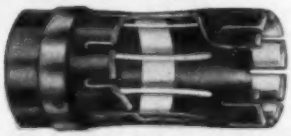
NOW AT STANDARD PRICES SHEFFER SELF-CLEANING COLLET*



Inclined planes throw coolant sludge chips away from slits. Proved highly efficient in preventing travel of sludge back to mechanism. Reduces down-time.

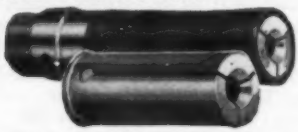
SHEFFER PRODUCTS ARE BEST

SHEFFER "ECONOMY" PUSHER* GIVES MORE PIECES PER BAR



Dual bearings for positive grip with less pressure. Gives more pieces per bag. Available in solid bronze for soft finished surfaces. Also conventional and "squirrel cage" pushers.

SHEFFER "BB" PUSHER HAS* SIMPLE ONE-PIECE INSERT



Single insert holds stock in most cases to full rated capacity. Reduces stress and wear. Easy to stock and assemble. Made in several materials. Also available with 3-piece pads.

*Patent applied for

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UP-TO-THE-MINUTE INFORMATION

EASY TO READ

SHEFFER HAS COMPLETE LINE OF SCREW MACHINE ACCESSORIES

Collet tubes and pushers, tubes with spools, etc., collet tube adjusting nuts, pusher tube bushings for all automatic screw machines.

SHEFFER COLLET CO.
TRAVERSE CITY, MICH.

MEET THE DEMAND FOR PRECISION
WITH TOOLS THAT MAKE PRECISION EASY

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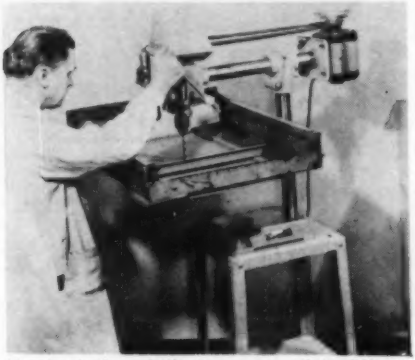
mortising, plug cutting, and many other operations.

Featured is a head that swivels 360° around the column and tilts more than 90° to the right and left. Because the



Head swivels and tilts to accommodate difficult drilling operations.

work is said to always remain parallel with the base, every operation can be done safely, easily and accurately.

A choice of four speeds, 700, 1,250, 2,400 and 4,700 rpm, is offered.

A big ¾" x 23-¾" x 15⅞" table is provided. The table is mounted to a fully machined 8½" x 9" cast iron table for extra precision drilling operations.

Rockwell Mfg. Co., Delta Power Tool Div., Pittsburgh, Pa.

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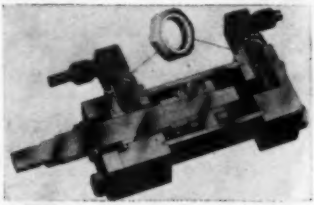
Port Seals For Power Cylinders

Port seals which are claimed to provide perfect sealing, speedy positioning, and complete protection from over-tightening damage are now furnished as standard, at no extra cost, on all standard models of air and hydraulic cylinders, boosters, and accumulators



Port seal is corrosion-resistant.

manufactured by the Miller Fluid Power Division.

The port seals are a (patent pending) device consisting of a hexagonal steel threaded nut with a threaded Teflon sealing insert reported as impervious to the chemical or corrosive action of all hydraulic fluids, air, steam, water, gases, and practically all chemicals.

Miller Fluid Power Div., Flick-Reedy Corp., Bensenville, Ill.

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MAKE EXPERIMENTAL-REPLACEMENT SPRINGS

Fast. Accurately

Makes any number of coils or pitch desired, right or left hand springs. No lathe required, clamps in vise. Sizes No. 2, 3, & 4 use wire sizes .057, .128, & .229; priced at only $37.50, $47.50, & $57.50. Hundreds in use. Ask for folder, or order TODAY!

THE BLANER MANUFACTURING CO.
1524 MAIN ST., CUYAHOGA FALLS, OHIO, U.S.A.

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READING BENCH KEYSEATER

Portable — move directly to job; a time saver for both small and large shops.

3¾" stroke; adaptable for other work.

Low first cost, prompt delivery.

Good dealers wanted

Reading Machine Co.
Cincinnati 37, Ohio

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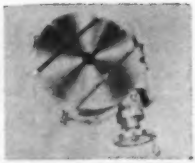
ROTARY TABLES, in four new additional models, are designed for use in horizontal and vertical positions. Three sizes are offered—9", 12" and 15", known as Models U-9, U-12, U-15 and U-15-4. A guaranteed accuracy of 60 sec. or less through 360° rotation is reported. Dividing attachments are available. Troyke Mfg. Co., Cincinnati, Ohio.



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Automatic Screw Feeder Feeds All Type Screw Fasteners

A new automatic screw feeder has been designed for use with all makes of pneumatic and electrical tools to feed and position all types of screw fasteners.

Designed for vertical screw driving operations, the Strippit Zipp Screw Feeder eliminates manual screw placement and is set at the factory to drive specific types of screws. Featuring a minimum number of moving parts and simplicity of design, the screw feeder consists of a hopper holding the screws and an elevator which picks up the screws and feeds them, one at a time, through a plastic tube by gravity with each driving stroke of the tool.

Wales-Strippit states that the screw feeder is especially effective for long-run production particularly in the assembly of appliances, electrical and electronic components and in metalworking and woodworking applications which require continuous screw driving operations.

Wales-Strippit, Inc., Akron, N.Y.

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DANNEMAN *Precision* **DIE SETS**

Precision bored on master plates

Catalog on request

DANNEMAN DIE SET DIVISION
Acme-Danneman Company, Inc.
203 Lafayette St., New York 12 • AL 5-7150

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BARKER DUAL-HEAD MILLING MACHINE

Two 1/3 H.P. Motors
1725 R.P.M.

For High Production Machining of Two Surfaces Simultaneously.

Model P.M.D.
*Base Price
$833.75
*Subject to change without notice.

Pedestal and Power Feed Extra

WRITE FOR COMPLETE DATA ON THIS MILL AND OUR LARGER MODEL A.M.D. DUAL MILL.

For Use with Carbide Tools

BARKER ENGINEERING CO.
Division—The F. HOHLFELDER CO.
26470 LAKELAND BLVD., CLEVELAND 32, O.

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CAM MILLING

Fully equipped modern machine shop with extensive **Jig Boring, Surface Grinding, Horizontal Boring** and **Thread Grinding** facilities as well as modern **Cam Milling** and **Cam Grinding equipment.**

Your Inquiries Answered Promptly

HIMOFF MACHINE CO., INC.
23-22 44th Road Long Island City 1, N.Y.

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while our stock lasts-

$187.50

F.O.B. ELIZABETH, N.J.

for

ACROMARKER

Name Plate and Parts Stamping Machines

Model No. 1

For Steel Metals Fibre Plastic

Sizes— 1/16", 3/32" 1/8", 5/32" 3/16"

Heads and Characters Replaceable

40 CHARACTERS

The ACROMARK Company

15 Morrell St. Elizabeth 4, New Jersey

Ship ____ ACROMARKERS @ 187.50 each

To: NAME _____

COMPANY _____

STREET _____

CITY _____ State _____

Thousands in use — fully guaranteed

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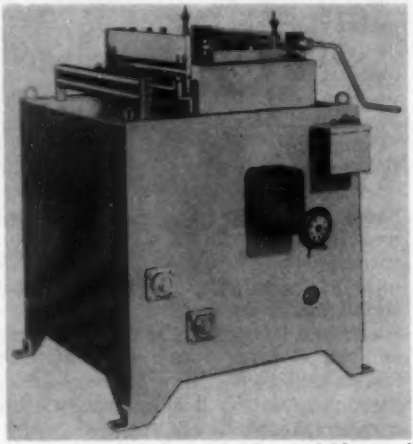
Combination Automatic Feeder And Roll Straightener

Combination feeding and straightening machine combines the features of a roll straightener with those of an automatic feeding machine and is available with either one or two electromagnetic drive clutches controlled by an adjustable feed length measuring "timer."

The machine is capable of feeding uniform, controlled lengths of coiled, flat or strip stock, simultaneously passing them through a series of powered rolls, thus producing flat stock free of curl or camber. On the standard models the timer can be set to produce virtually any length up to 60", at which time the drive clutch disengages and the timer automatically resets itself for a repeat cycle. By adding a timer bypass circuit, work of any length can be fed.



Two styles offered—one having variable speed drive, the other, fixed rate feed.

Machine is available in two styles, one having a variable speed drive which adjusts to the desired feed rate and the other having a fixed rate feed. Various sized machines accommodate stock up to 50" wide, and in various gauges; larger sizes on order.

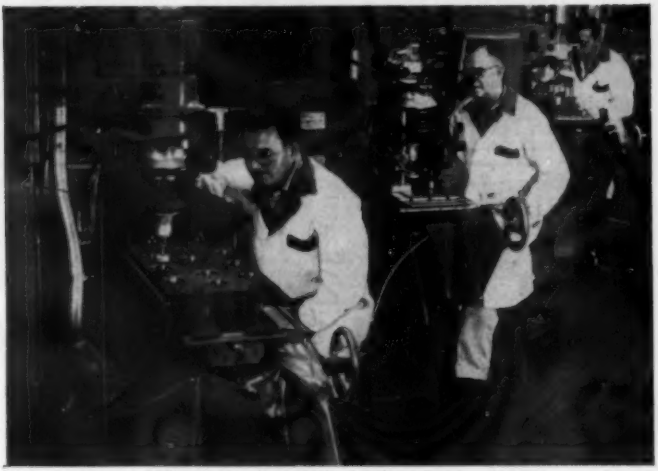
Benchmaster Mfg. Co., Gardena, Calif.

Use postpaid card. Circle No. 133

Val Koller tells why he continually adds more Moore Jig Borers and Jig Grinders to his team

This is another in a series featuring the views of owners of leading tool and die companies.

by **VAL KOLLER**
President
Koller Die & Tool Co.,
Milwaukee, Wisconsin
Manufacturer of Dies
and Metal Stampings—
Tools—Jigs—
Fixtures and Gages—
Special Machines



Moore equipment in Koller plant, with new #3 Jig Grinder in foreground.

"Since our foundation in 1919 it has been my personal objective to strive for perfection. Since that time perfection has evolved into a .000010" word for tool and die makers. Such precision is rapidly becoming common-place... particularly in electronics and guided missile fields of production. With the installation of Moore equipment in 1950, we have been able to compete successfully in a caliber of work that before was not possible.

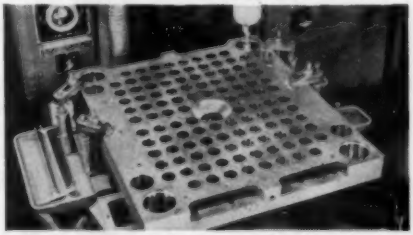
"Since that initial investment in a Moore Jig Grinder we have continually added Moore teammates to our toolroom. Today we operate more Moore equipment than any other top contract shop in the greater Milwaukee area.

"The tolerances and intricate contours now required make Moore Jig Borers and Jig Grinders a must in each toolroom. These machines operate at full capacity each workday with negative downtime due to mechanical failures. In fact, we have found that it costs real dollars and cents to operate *without* Moore equipment.

"This cost factor is just one of many reasons why we recently added another teammate to our toolroom ...the new Moore Model #3 Jig Grinder. This machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better."

Write today for literature describing the unique features of #3 Moore Jig Borers and Jig Grinders or see our catalog in SWEET'S MACHINE TOOL FILE.

MOORE SPECIAL TOOL COMPANY, INC.
728 Union Avenue, Bridgeport, Connecticut



This 116 cavity mold plate was completely jig ground at Koller on a Moore Jig Grinder. Tolerances: hole location ± .0001", hole diameter ± .0001".

HOLES, CONTOURS AND SURFACES, tells how to produce tools and dies the modern way. 424 pages, 495 illustrations. $5 in U.S.A. $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS PRECISION ROTARY TABLES HOLE LOCATION ACCESSORIES

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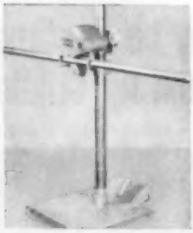
Offset Bar and Tube Printer



A new offset bar and tube printer, known as the "Economy" model, complements the Pannier line of larger in-line production bar and tube printers. Its smaller size and mobility, when mounted on its portable stand, permits its use also as a utility printer.

This unit offset-prints bars and tubes of metal or plastic from ¼" to 11" O.D., without changing guide wheels, and operates at speeds up to 250 fpm, with a continuous message in characters from 1/16" to 3/4" high. It is especially well adapted for marking plastic tubing at extrusion speeds as low as one fpm. The printing wheel has a printing circumference of 12", face width, 1".

The Pannier Corp., Pittsburgh, Pa.

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Cut MACHINING COSTS With

MAXWELL CARBIDE "THROWAYS"

Adjustable BORING & REAMING Cutters

USE Carbide Inserts

Replace Tips Only!

Cutters Easily Adjustable

Index Carbide FOUR times and SAVE

Ask your Maxwell representative or write

No need to buy new holders when carbide is worn. Save time, save money with MAXWELL *adjustable* boring and reaming cutters—index carbide for FOUR cutting edges.

Maxwell adjustable cutters fit ANY standard boring or reaming bars. Cutting capacities—1¾" to 6"; accommodate carbide tips: ⅜ x ⅞" to 1⅛ x ⅜".

A-528A

MAXWELL INDUSTRIES, Inc.

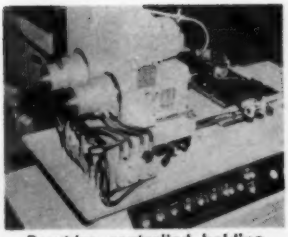
493 E. 5th St. Ashtabula, O.

Use postpaid card. Circle No. 423

Collet Actuator

The Model 3A collet actuator is a non-rotating air cylinder used to operate collets, step chucks, and expanding mandrels on lathes, grinders, and boring machines. The collet actuator illustrated is mounted on a small precision boring machine, and provides controlled holding pressure when machining. A flow control valve prevents draw back of the work when the collet is closing. The hollow draw tube permits work, tools or coolant to be passed through the spindle.

PowerGrip, Inc., Rockfall, Conn.



Provides controlled holding pressure.

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M-B PNEUMATIC GRINDERS

Model M-CR-B

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Model HD-CR

Outstanding, powerful, fast-cutting tools of proven high efficiency. Designed for tough jobs and real production. Perform indefinitely and dependably. Precision made. Steel housing for safety. Also other models.

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DETROIT 3, MICHIGAN

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SERIES 8055

COMBINATION MODEL

The Series 8055 is two electric heat treating furnaces (Hardening 2,000° F. and 2,300° F., and Drawing 800° F. and 1,250° F.) in the floor space of one furnace. Each furnace is independently controlled permitting hardening and drawing operations to be performed at the same time. All models are delivered with separate controls for each furnace. The 8055 series is made in nine standard sizes . . . other models are made to your specifications. Furnaces operate on standard line voltage . . . no transformer necessary. A hardening and preheating combination is also available.

Write for a free catalog of the entire Lucifer line. Engineering advice is offered without obligation. Write, wre or call . . .

LUCIFER

FURNACES, INC.

NESHAMINY 1, PA.

Phone: Diamond 3-0411

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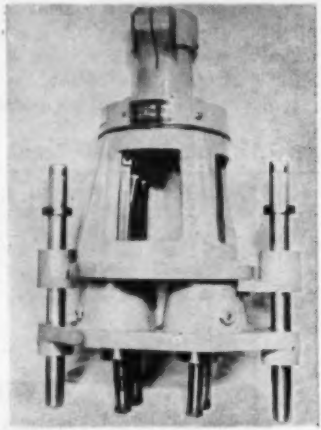
Adjustable Drillhead Taps Holes At An Angle

Multiple spindle drilling or tapping of holes at an angle is reported possible using a Thriftmaster universal joint type adjustable drillhead with cartridge type spindle construction.



Four holes are tapped, each at 4° angle with the vertical.

The illustration shows how a Thriftmaster 4-spindle full ball bearing universal joint type adjustable drillhead taps four holes each at a 4° angle with the vertical. The adjustable feature is a result of a special design adaptation of the recently developed Thriftmaster cartridge type spindle construction. Using a different cartridge plate will permit minor changes of the center distance or the angle of the spindles.

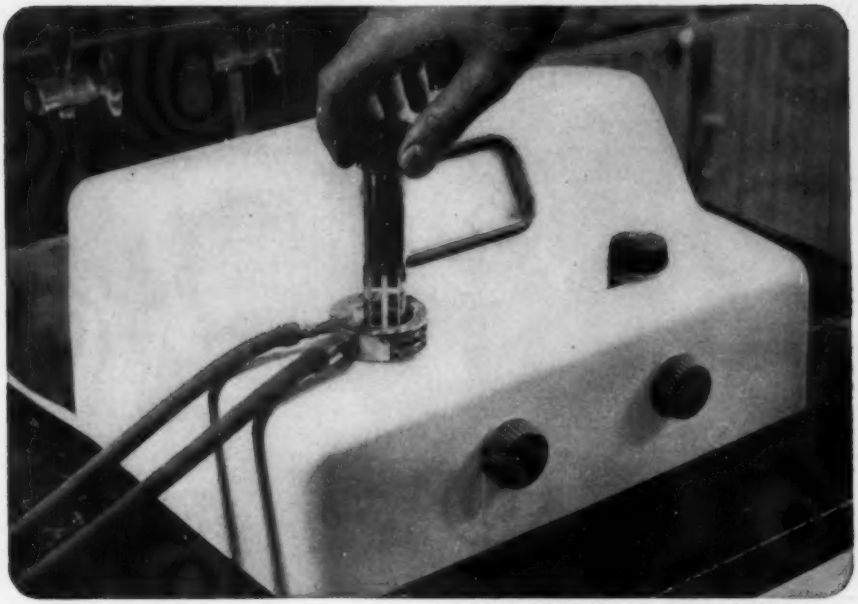
Thriftmaster Products Corp., Lancaster, Pa.

Use postpaid card. Circle No. 136

Deburrs & Chamfers Both Ends Of Spur, Helical Gear Teeth

A twin-spindle automatic high speed grinder is designed to simultaneously deburr and chamfer the entire contour of both ends of the teeth on spur, helical or bevel (heel and toe) gears. The grinder drives reinforced wheels at 17,000 rpm with standard air spindles. Depending on gear size, wheel diam-

***Experience**—the added alloy in **Allegheny Ludlum** tool steels*



COLORIMETER (inherently extremely accurate) determines percentages of molybdenum, tungsten, cobalt and manganese in A-L tool steel to insure consistent, high quality.

Colorimeter measures exact chemical composition of Allegheny Ludlum tool steel melts

Accurate adjustment of alloys guarantees uniform heat treatment, predictable dimensional changes, reduced grinding, standardized machining operations.

Close control of molybdenum, tungsten, cobalt and manganese is at the heart of a good tool steel melt. In addition to the usual testing methods, Allegheny Ludlum's chemical laboratory checks these metals with Colorimetry because of its inherent, extreme accuracy.

On the basis of the Colorimeter's findings, it is possible to make carefully calculated furnace additions of ferro-alloys, insuring precise control over chemistry. This guarantees your receiving the *exact* analysis order after order, providing *uniformity of heat treatment, predictable dimensional changes, reduced grinding and standardized machining operations.*

WSW-7262

Colorimetry is but one step toward careful control over composition. Allegheny Ludlum also sets exacting purchasing specifications on raw materials and scrap. Quality Control checks all incoming orders to see that they conform with these specifications. Another guard toward your getting your exact specifications: each ingot bears a metal tab showing heat number.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

ALLEGHENY LUDLUM STEEL CORPORATION, Oliver Bldg., Pittsburgh 22, Pa. Address Dept. MB-36

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country ... Check the yellow pages

every grade of tool steel ... every help in using it

Use postpaid card. Circle No. 426

eters from 1.75" to 3.00" are used. Spindles rotate in a direction which prevents wheels from "digging in."

The standard machine will handle gears from 3" to 13" O.D.; other models are available for gears to 20" O.D.

Operator is shielded by a protective

All movements and pressures for the automatic cycle can be adjusted for gears from 3" to 13" O.D.

hood but can view the process through a window in the hood.

Michigan Tool Co., Detroit, Mich.

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Practical Cabinet Mounting For Hand-Operated Punch Presses

Sturdier anchorage and convenient tool storage are two important advantages offered in the new cabinet-mounted No. 91 and No. 92 presses. The sturdy base, firmly secured to the floor, permits operation of these hand presses to their full 10-ton capacity.

As many as 28 sets of punches and dies can be stored in racks in the rear of the cabinet.

Base of the cabinet is 14"x26"; die height is 38½" on No. 91 and 40½" on No. 92.

W. A. Whitney Mfg. Co., Rockford, Ill.

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HIGH PRODUCTION
LOW COST
PRECISION
SMALL PART MILLING

Hand lever operation or calibrated feed screw
Vertical mill available

Price complete as above $320.00 (less motor)

LMG
Manufactured by
NORTHERN ILLINOIS MACHINISTS
Crystal Lake Rd. • McHenry, Ill.

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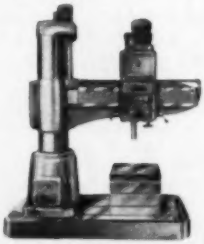
Famous GIRARDS Radial Drills
with
electro-mechanical clamping of arm on column and spindle head on arm.
Available now for immediate delivery from New York stock.



GIRARDS Radials are available in sizes from 14" column x 3 ft. arm to 22" column x 8 ft. arm.

Please ask for price quotations.

BARER ENGINEERING & MACHINERY CO., LTD.
Champlain — New York
Telephone — AXminster 8-3811

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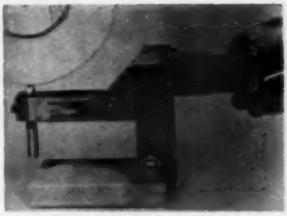
Redesigned Radius Dresser Is Accurate to .0002"

The newly redesigned model "SS" radius dresser claims to maintain an accuracy of .0002". The new model has an enlarged capacity, dresses all abrasive wheels up to and including 12" in diameter. The manufacturer also reports there isn't any need of removing the wheel guard as the wheel is dressed from below. Easy-to-see operation permits even inexperienced operators to quickly dress convex, concave, and complex combination shapes. There is complete adjustment from 90° through 180°.

Somerset Tool Co., Hillside, N.J.



Easy-to-see operation.

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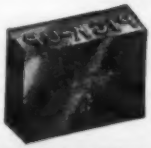
MORE IMPRESSIONS PER DOLLAR WITH "GTS" TOOLS



GTS produces Marking Tools of uniform quality.

Your most rigid requirements will be met with every tool which bears the GTS trademark—whether your need is for one tool or for thousands.

From raw stock to final inspection, these tools are produced in our own plant by skilled craftsmen using the most modern facilities.

Hundreds of standard items can be shipped from stock. A complete inventory of alloy steels permits quick delivery on tools made to order.

Use GTS tools and *you'll* know that there is real economy in buying the best.

IF IT'S WORTH MAKING, IT'S WORTH MARKING

GEO. T. SCHMIDT, INC.
1802 W. BELLE PLAINE AVE.
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True Conical Grinding on a STERLING Drill Grinder gives you Faster Cutting Drills and More Holes per grind

Conical grinding of a drill point produces the same clearance angle from O.D. to web. The drill enters the work easier, cuts a uniform chip that requires less pressure, less power.

STERLING "DV"

$590.00

F.O.B. Eau Claire, Wis.

CAPACITY

90°—140° Included angle, variable clearance angle set with built-in gage. Grinds ⅛" to 2½" drills; 2, 3 & 4 flutes.

Set-up is simple and fast because no chucks or collets are used. Built-in diamond wheel dresser produces a finished cutting edge that stands up longer. You get more, accurate holes with drills ground on a STERLING "DV".

Ask your STERLING Dealer for complete information on all STERLING Drill Grinders or write direct

McDONOUGH MANUFACTURING CO.

1520 GALLOWAY • EAU CLAIRE, WISC.

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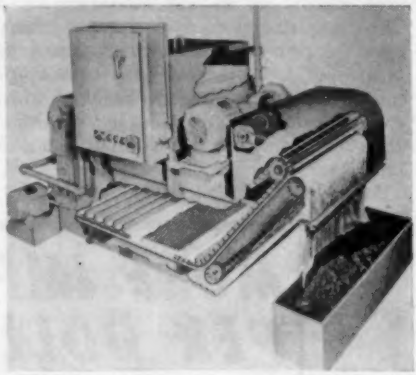
Automation in Filtration

The new Hydro-Vac filter is a completely automatic unit designed to operate with pressure and vacuum on the media, and the lowest possible liquid inlet height.



Operates with pressure and vacuum on the media, and the lowest possible liquid inlet height.

This was accomplished by designing a filter where the media travels on the bottom of a settling tank and above a vacuum box. Dirty coolant returning from the machines enters the filter approximately 18" above the floor. The dirt laden liquid passes downward to the filter media where all contaminants are removed.

Dirt remains on the media and the clean liquid passes to the suction of the filter pump. The coolant then can be pumped either directly to the machine or to a clean coolant reservoir. When the media is completely contaminated, a scraper conveyor and the media travel to discharge the sludge into a hopper.

Hydromation Filter Co., Detroit.

Use postpaid card. Circle No. 140

Vertical Mill Offers High Capacity

A new vertical toolroom milling machine with the range and capacity of larger mills, yet designed to sell for less than $1,000, is built accurately and ruggedly to accepted machine tool toler-

ances. The manufacturer also reports that, although low in cost, this Millrite is highly productive for precision milling and boring operations.

Equipped with a swivel head, the

Six spindle speeds from 250 to 3450 rpm or alternately 185 to 2550 rpm.

machine is capable of angular, as well as vertical operations. The ram and turret machine has a 7"x27" table with longitudinal feed of 16", crossfeed of 8", vertical feed of 15", and ram movement of 12". Quill travel is 4". Maximum distance from the spindle nose to the face of the column is 16"; maximum distance from the nose to the top of the table is 18".

New type V-belt drive transmits full power of the ¾ hp motor at all six spindle speeds, from 250 to 3450 rpm or alternately 185 to 2550 rpm.

The U.S. Burke Machine Tool Div., Cincinnati, Ohio.

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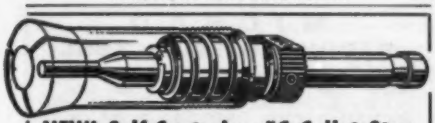

NEW! Self-Centering 5C Collet Stop

Quick friction adjustment. Stays in fixed position. Will not distort collet. Will not move back. Also available for other collets and spindles. 30 Days Free Trial. Several Territories Open for Distributors

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6106 Park Ave. South Minneapolis 17, Minn.

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DIAMOND WHEEL DRESSERS

Made of selected, full individual stones, mounted in 7/16" diameter x 6" long cold rolled shank.

Karat	Regular Price	Our New Price
¼	$ 6.00	$ 2.85
½	12.00	5.00
¾	21.00	7.50
1	30.00	10.25
1½	54.00	15.00
2	75.00	20.00
2½	102.00	26.00
3	130.00	32.00

These diamonds can be set in any shank to your specifications for $1.00 each extra.

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STRONGEST PERMANENT MAGNETIC GRIP at lowest cost

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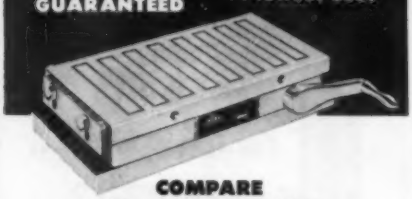

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SIZE	HEIGHT	PRICE
5 x 10"	2½"	84.00
6 x 12"	2⅝"	115.00
6 x 14"	2⅝"	125.00
6 x 18"	2⅝"	169.00
8 x 24"	2⅝"	295.00

Complete range of rectangular and round sizes in stock.

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INDUSTRIAL CORPORATION
41 East 42nd St., Dept. F-2 New York 17, N. Y.

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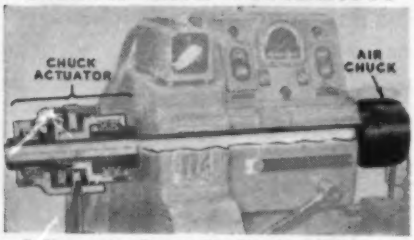
Revolutionary New Chuck and Actuator!



Safe, proven Gamet Air Chuck and Powergrip Chuck Actuator installs easily on your lathe. Saves money—gets results. Makes it possible for you to:—

- Use lathe for both bar and chucking work.
- Use the draw tube hole for coolant, or tools.
- Eliminate air leaks and reduce flywheel effect.

Guaranteed for One Year. Chuck Size 4¼" to 14".

POWER GRIP, INC.
ROCKFALL, CONN.

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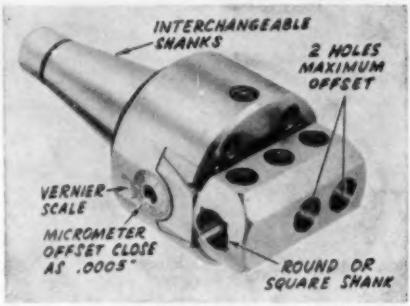
New Offset Boring Head Models

The new 60 series round contour offset boring heads are offered with a long and stockier tool block for better securing the horizontal tool and permitting heavier cuts. A vernier on the body facilitates adjustment of the micrometer



Three sizes are offered with nominal ½", ¾" and 1" bar capacities.

offset screw for extremely close visual offset adjustment. This same feature is now included in the 30 and 40 series heads.

Though standard with 20 pitch dia. offset screw, the 60 series introduces, at no extra cost, availability of 40 pitch dia. offset screw, permitting offset adjustment as close as .0005" per graduation on the screw dial. The 30 and 40 series also have this feature.

Three sizes are offered with nominal ½", ¾" and 1" bar capacities.

Flynn Mfg. Co., Detroit, Mich.

Use postpaid card. Circle No. 142

MICRAD
RADIUS DRESSING TOOL

Accurately dressing small radii (.007 to .125) into grinding wheels is easily, quickly and economically done with the MICRAD RADIUS DRESSING TOOL. Here is a new approach to radius dressing which will save time and money, too. Priced below $30.00. Send now for helpful, illustrated literature.

Manufactured by

HENNIG TOOL PRODUCTS CO.
652 W. 134th St. Chicago, Illinois

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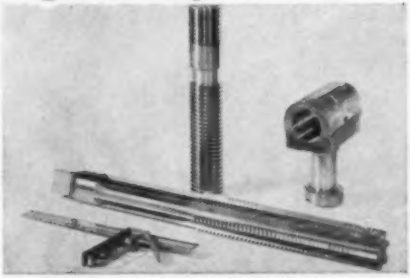
Single-Pass Tap



Tap sizes range from 3/8" to 2½" diameter.

This newly designed tap, in a single operation, threaded a 2¼"-four pitch, two start, Acme thread in a bronze nut 7" long (shown in photo), producing a class 3G fit. The job had previously required the more expensive multiple tapping method.

The new tool incorporates the lead screw pilot to assure close concentricity between the axis of the thread and the bore of the hole to be tapped. Ample area in the flutes provides for carrying out the chips without jamming.

Single-pass Acme taps are offered in sizes from 3/8" to 2½" diameter.

Horspool & Romine Mfg. Co., Oakland, California.

Use postpaid card. Circle No. 180

Wheel Boring Tools With Round Button Inserts

New Kendex wheel boring tools with screw-on type round button inserts are announced. The new Style RWR roughing holders fit standard four-tool type "L" boring bars for rough boring.

Standard Style CDH-42 heavy-duty Kendex inserts with 1" diameter cutting edge can be rotated to a new edge without disturbing the holder setting. They can be resharpened easily by grinding the top surface.

Nearly all requirements can be met with eleven holders which are stocked. Inserts are made in two Kennametal grades. Chip breakers are also available.

Kennametal Inc., Latrobe, Pa.

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WALLACE BENDS

give tubing, pipe, structural shapes and solids the contour you need for the use intended. That is why production men have been bringing bending problems to Wallace since 1896. It is the time-proved way to bend a production curve upward and a cost curve down.

WALLACE BENDERS

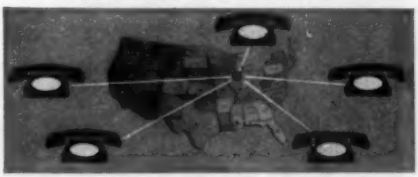
serve outstanding metal fabricators the world over, many of them exclusively. The complete Wallace line includes ram benders, rotary and roll benders, automatic and manually operated, in the widest range available. For the job you do, Wallace builds the bender.

FROM YOUR DESK OR SHOP, ANYWHERE

CALL WALLACE COLLECT

BUckingham 1-7000, Chicago

Ask for Bob Baxter. It's the quick, direct way to expert help on a bending problem. Wallace pays charges. Call Bob Baxter now.



SEE BENDING AS OTHERS DO IT

Pictures of actual bending operations abound in the Wallace "Take A Peek" Book. It's free. Get it.

Phone or Write Bob Baxter

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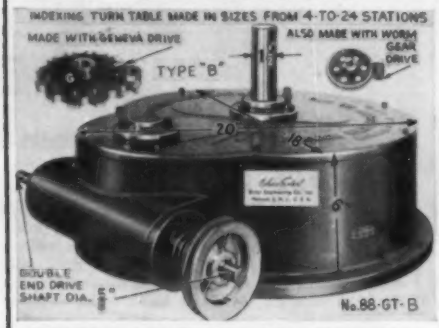
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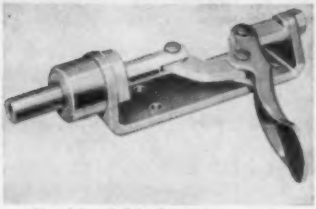

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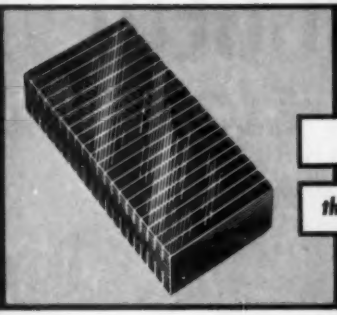

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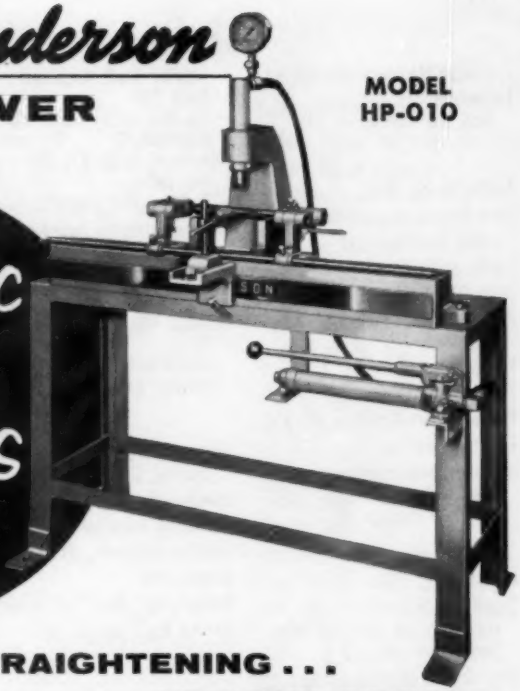

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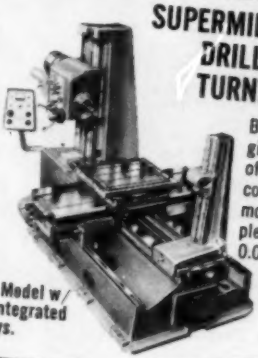

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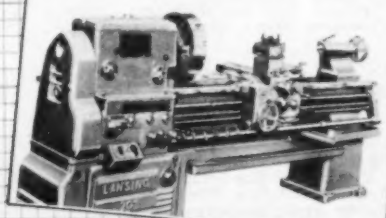

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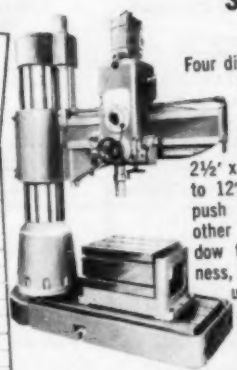

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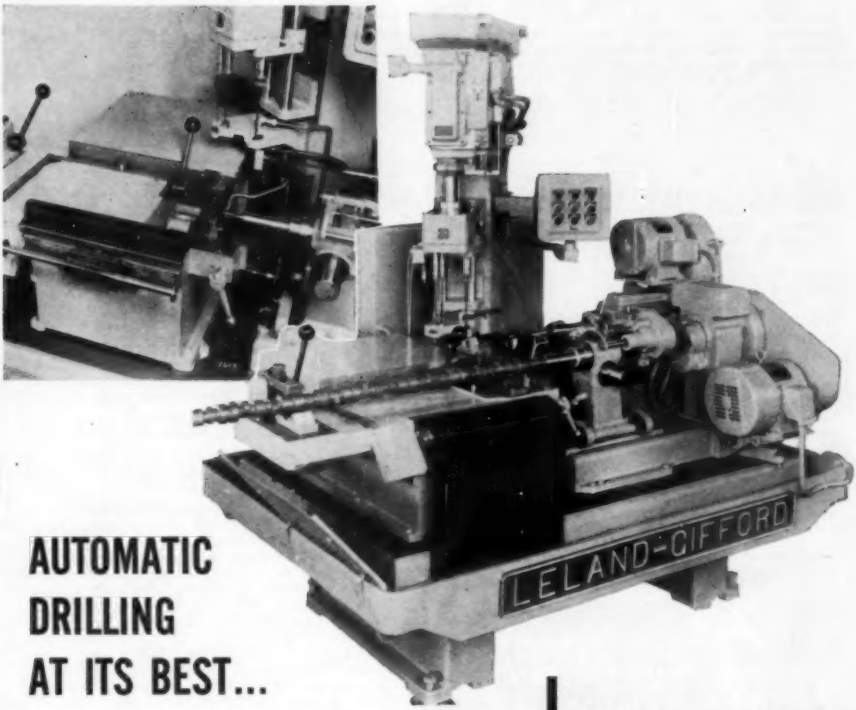

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00	96
0	70-72-78-80
1	48-56-64-72-80-90
2	48-52-54-56-64-72-80
3	40-44-46-48-56-60-64
4	32-36-40-48-56-60-64 72-80
5	30-32-36-40-44-48-56-64-80
6	30-32-36-40-48-50-60-64 72-80
7	30-32-36-40-48-64
8	24-30-36-40-44-48-56-60-64-80
9	24-28-32-36-40
10	28-30-36-40-48-56-60-64
12	20-22-24-28-30-32-36-40-56-60
14	20-24-28-32-40
1/16	60-64-72
5/64	72
5/32	36-48
1/8	32-36-40-44-48
5/32	32-36-38-40-44-48
3/16	20-24-28-32-36-40-48
7/32	20-24-28-32-36-40
1/4	14-16-18-22-24-26-27-28-30-32-36-40-48-56-64
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11/32	20-28-32-40-48
3/8	12-13-14-18-20-22-27-28-30-32-36-40-48
13/32	16-20-24-32
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1/2	12-13-14-18-18-20-24-27-28-32-36-40
9/16	12-14-16-18-20-24-27-28-32-36-40
5/8	10-11-12-14-16-18-20-24-27-28-32-36-40
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1-9/16	12-14-16-18-20-24
1-5/8	5½-6-8-10-12-14-16-18-20-24
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2	8-10-12-14-16-18-20
2-1/16	12-14-16
2-1/8	8-10-12-14-16-18-20
2-3/16	10-12-14-16
2-1/4	4½-8-10-12-14-16-18
2-5/16	12-14-16-18
2-3/8	10-12-14-16-18
2-1/2	4-8-10-12-14-16-18
2-9/16	12-14
2-5/8	8-10-12-14-16-18
2-3/4	4-8-10-12-14-16
2-7/8	8-10-12-14-16
3	4-8-10-12-14-16
3¼	8-10-12-14-16
3½	8-10-12-14-16
3¾	4-8-10-12-14
4	8-10-12

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1-11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4½-10-12

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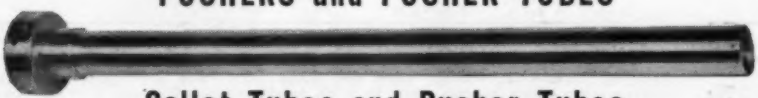

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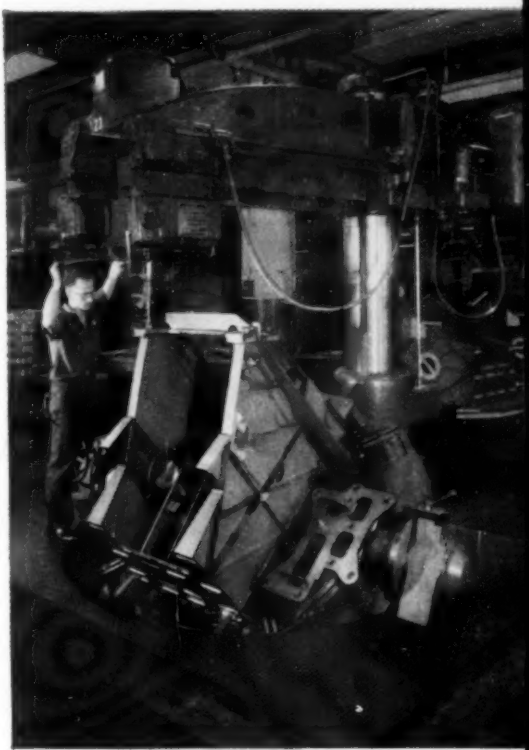

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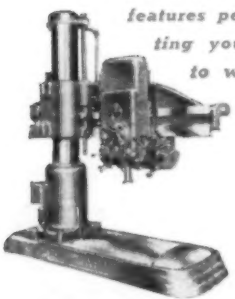

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